

Review of the Appropriateness of the California High School Exit Exam Content Standards for High School Accountability

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Executive Summary

Review of the Appropriateness of the California High School Exit Exam Content Standards for High School Accountability

In 1999, the California legislature established the requirement that students pass the California High School Exit Exam (CAHSEE) covering English-language arts (ELA) and mathematics in order to receive a high school diploma. The federal No Child Left Behind (NCLB) Act signed by the President January 2002, requires states to implement measures of student achievement that can be used for school accountability at grades 3 through 8 and in high school. California decided to use the CAHSEE as the high school accountability measure. The CAHSEE was selected as the best measure of what all high school students should know and be able to do. Also, unlike some end-of-course tests, the CAHSEE is taken by all high school students, thus making it appropriate for the 95 percent participation criterion also included in NCLB.

Because the CAHSEE is a cumulative measure of what students are expected to learn, it includes some topics first introduced before high school, and this raised some questions in a preliminary review by the U.S. Department of Education. To make sure that the CAHSEE provided an appropriate measure for high school accountability, the California Department of Education (CDE) asked HumRRO, as the independent evaluator of the CAHSEE to also evaluate the use of the CAHSEE for high school accountability. This report documents the results of that review.

Development and Approval of the CAHSEE Content Standards

The legislation establishing the CAHSEE called for an independent panel to recommend content standards that students should be required to master for high school graduation. Following provisions in the legislation, a panel of teachers, principals, school board members, parents, and the general public was appointed by the Superintendent and approved by the Board. The High School Exit Exam (HSEE) Panel first met in July 1999 and continued to meet frequently over the next year. Their meetings were public and included input from a wide variety of stakeholders on appropriate content and rigor for the new graduation test.

A key question for the mathematics portion of the test was whether to include algebra and, if so, how to identify standards appropriate to the different ways algebra was taught in California. This was an issue because, prior to this time, many districts did not require students to take algebra as a condition for graduation. In a December 1999 interim report to the Superintendent of Public Instruction, the panel stated:

In mathematics, the Panel examined closely the new standards which reflect a considerably higher level of achievement than that expected in the past. ... The Panel concurs with the Governor and you that algebra must be part of a student's K-12 educational experience. The standards recommended are ones that are taught in a variety of algebra courses, including traditional algebra, CPM, and integrated math. They reflect a rigorous and challenging algebra program, but also provide teachers the time and flexibility to address additional standards in ways that best work

for the students. In this sense, they are consistent with the differentiated algebra standards included in the new math framework which has been approved by the State Board." (HSEE Panel, Dec. 3, 1999)

The State Board of Education (SBE) considered the HSEE panel's recommendations and also considered recommendations from CDE for minor modifications to the recommended test blueprint in mathematics. CDE was concerned with the overall length of the test and the degree of emphasis on algebra, a course students had not previously been required to take for high school graduation. In fall 2000, the SBE approved test blueprints for the CAHSEE based on the HSEE panel's recommendations and the modifications recommended by CDE.

In July 2003, the SBE approved a two-year deferral of the CAHSEE requirement, delaying the requirement until June of 2006. The primary concern was that a significant number of students were not yet ready to meet the requirement and that more time was needed to improve both initial and remedial instruction provided to students. The SBE also approved changes to the test blueprints, primarily to reduce testing time requirements from three days to two days.

The High School Content Comparison Study

In evaluating the appropriateness of the CAHSEE for high school accountability, HumRRO conducted a high school content comparison study, comparing the CAHSEE content standards to content standards used with high school accountability measures in other states. The first step in this study was to assemble information from various reviews of high school accountability systems in as many other states as possible. Results indicated that 36 states use customized standards-based tests for high school accountability, another 7 states use end-of-course measures, 4 states use off-the-shelf (norm-referenced) tests and 2 more use augmented versions of norm-referenced tests. Of the 25 states that have or soon will have a high school graduation test, 19 are planning to also use these exams for high school accountability. (See Chapter 3 for details.) California is far from unique in this regard.

HumRRO sought to compare the standards assessed by the CAHSEE with the best available models of state standards that have been recognized for their quality. To this end, we selected seven states for each subject whose standards have either received high marks from *Education Week's* Quality Counts report (*Education Week*, 2005b) and AFT (2001), or were used as benchmark standards by Achieve (Achieve, undated). In addition, the selected states have different types of high school accountability measures (CCSSO, 2004a, 2004b), in that some were graduation tests while others were not.

Comparison Procedures

A workshop was held to collect judgments about the content standard used with the CAHSEE and with the high school accountability measure from the comparison states. A total of 24 content experts, 12 in ELA and 12 in mathematics were recruited from a neutral state, neither California nor any of the comparison states.

Across California and the 7 comparison states, the total number of content standards/objectives was too large for a single panelist to process. For this reasons, the comparison states were divided into three groups. The content standards from one state were sampled for use in training and practice materials. The remaining 6 states were divided into two groups of three. Each panelist received a deck of cards with one content standard printed on each card. States were not identified and the order of the content standard cards was randomized. Each deck included all of the ELA or mathematics standards from California and three of the comparison states.

Panelists were asked to sort the cards into groups that had similar content and later to sort the cards in each of the major groups into subgroups, identifying content standards that were unique. Results were combined across panelists and across the two sets of comparison states to define clusters of similar content standards (4 major content clusters for ELA and 5 for mathematics).

Panelists were also asked to rate the depth of knowledge required by each content standard and the clarity of the depth of knowledge required. Depth of knowledge is a concept used in most test alignment studies that assesses the cognitive complexity of the knowledge and skill required by the standard, from simple recognition or recall to complex problem solving.

Results of the Content Comparison Workshop

The distribution of content was found to be generally similar for California and the comparison states. For ELA, California and some, but not all of the other states included word skills. Several states included more extensive coverage of communication skills than did California. For mathematics, 35 percent of California's content standards were for algebra compared to a range from 14 to 15 percent in the comparison states. Another area where content coverage varied across states was labeled Mathematical Thinking. For California, 10 percent of the content standards were from this content cluster compared to a range of 2 to 32 percent in the comparison states.

The depth of knowledge ratings were found to be highly consistent across judges based on the correlation of ratings for California standards across the two comparison decks and also on correlations with similar ratings from test alignment workshops held in June 2005. Figures 3.4 and 3.5 from the body of this report show the average depth of knowledge ratings for the mathematics standards and ELA standards respectively from each content cluster and state. For mathematics, the California averages are about

the same as depth of knowledge ratings for other states. California is at the low end of the depth of knowledge ratings for Number Sense standards and at the high end among states that had standards in the Mathematical Thinking cluster.

Average DOK by Math Cluster and State

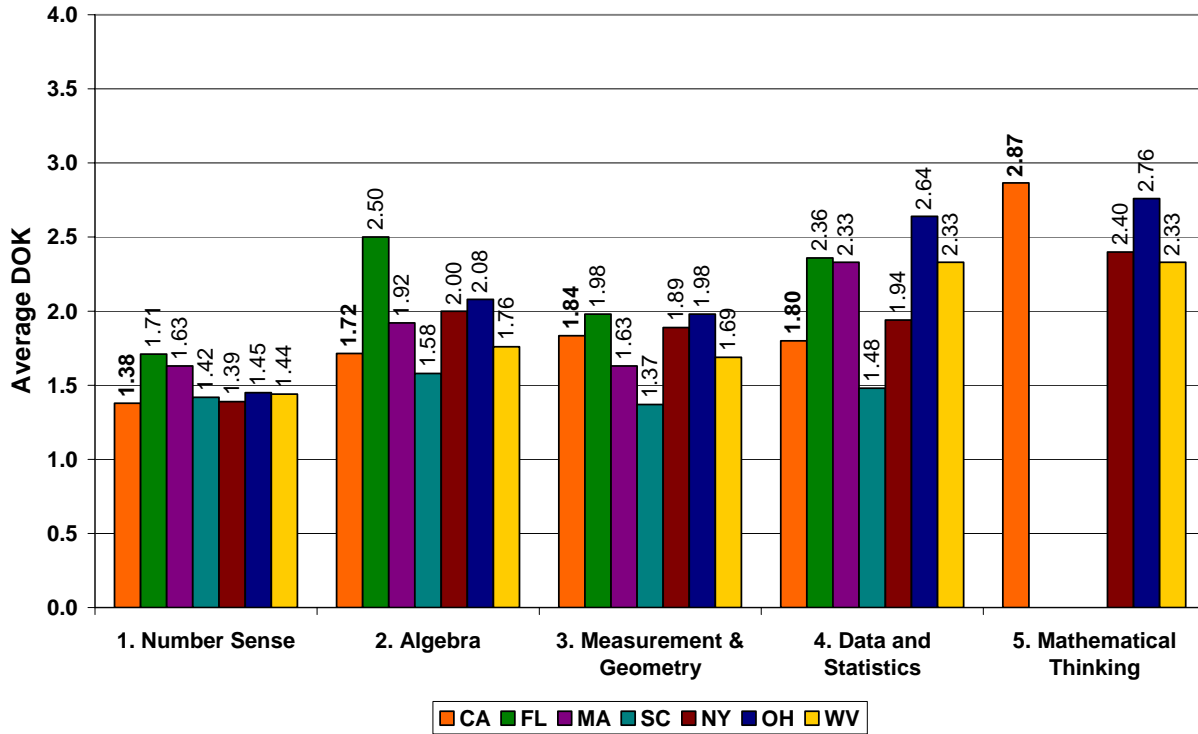


Figure 3.4 Average Depth of Knowledge by Mathematics Content Cluster and State

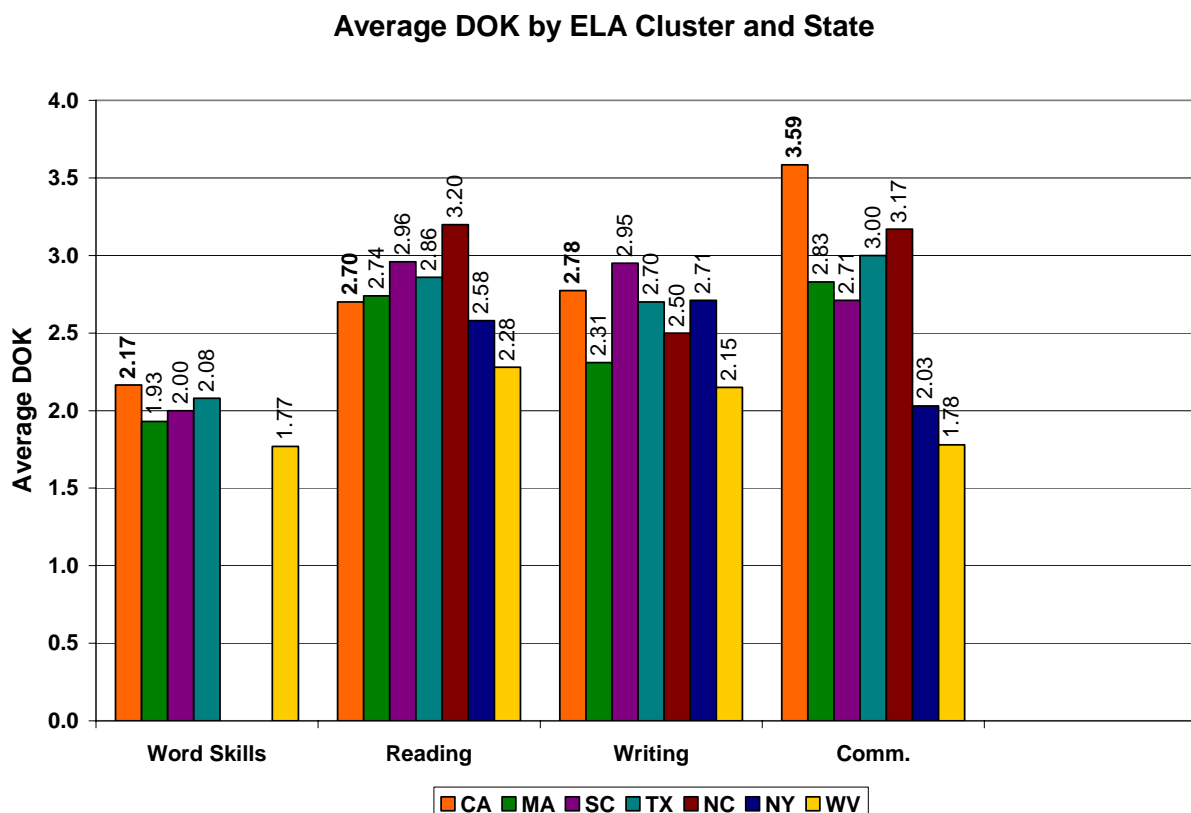


Figure 3.5 Average Depth of Knowledge of ELA Standards by State and Content Cluster

The clarity ratings for the California content standards compared favorably to those in the other states in nearly all of the different content clusters.

Review of California's High School End-of-Course Mathematics Tests

HumRRO also reviewed options for using one or more of the existing mathematics end-of-course tests for high school accountability. Of these, Algebra I is the only course required of all students, although some students take integrated mathematics courses that have separate end-of-course tests. In addition to the end-of-course tests, California has a General Mathematics test that is taken by 8th and 9th grade students who have not yet taken Algebra I. There is considerable overlap in the CAHSEE content standards and the content standards for the General Mathematics and Algebra I tests. Explicit differences are described in the body of this report.

In summary, the CAHSEE covers content from both the General Math and Algebra I assessments. Unlike the end-of-course tests, it is administered to all students during the 10th grade, a time when nearly all students have taken the required algebra course. The CAHSEE content standards are covered in courses through Algebra I that all students are required to take. It is reasonable to hold high schools accountable for student mastery of this material. It does not seem reasonable to include topics from

elective courses in a high school accountability measure. This would amount to holding high schools accountable for student mastery of topics they are not required to take.

Findings and Conclusions

The key findings from our review of the use of the CAHSEE for high school accountability are described here.

Finding 1. The content standards for the CAHSEE reflect broad input on what high school students should know and be able to do. Recommendations from the HSEE Panel and the CDE were considered by the SBE, the body with formal responsibility for implementing California's educational policy, in making final decisions on CAHSEE content.

California used a well-specified process to determine the content standards covered by the CAHSEE. This process included selecting a broadly representative panel, public meetings of this panel to receive broad input on factors that might affect their considerations, and review and approval of their recommendations by the SBE.

Initially, 9th graders were allowed to take the CAHSEE on a voluntary basis. Subsequently, it was decided that students should not be allowed to take the CAHSEE until they had completed at least a year and a half of high school. Even at this point, more than a third of California's high school students have not yet mastered the required content. Clearly, high schools have a major responsibility both for preparing students to take the CAHSEE in the 10th grade and for subsequent efforts to ensure that all students can pass the CAHSEE.

Finding 2. The range of content covered and depth of knowledge required by the CAHSEE are similar to the range and depth of high school accountability measures in other states.

The range of the CAHSEE content standards is similar to the range of standards covered in other states' high school whose content standards have been reviewed positively.

Finding 3. The content covered by the CAHSEE is broader than the content covered by either California's General Math or end-of-course Algebra I assessments, but not as extensive as the content covered by end-of-course assessments for subsequent, elective mathematics courses (Geometry, Algebra II, and Advanced Mathematics).

The mathematics end-of-course assessments do not provide a viable alternative for high school accountability. Content standards for Algebra I, the only course all students are required to take, are narrow and do not include the full range of

mathematical knowledge and skill judged important for graduation. Further, it would not be possible to include end-of-course tests for elective courses in high school accountability measures and still meet NCLB inclusion requirements.

Based on these findings, we conclude that the CAHSEE provides an appropriate measure for high school accountability. Students are not allowed to take the CAHSEE until 10th grade because many or most need courses provided by high schools during the 9th and 10th grade to be fully prepared to pass the test. In addition, high schools have a significant responsibility for ensuring that students who do not initially pass—roughly one-third of all students—reach the required level of achievement by the end of their senior year. It is difficult to see how a high school accountability system could go beyond the content required of all students. Further, the SBE set a higher target for the level of proficiency students would be required to meet for high school accountability than was set previously for the graduation requirement. Meeting the graduation requirement was considered to signify basic mastery of the required content. Higher levels were set for demonstrating proficient and advanced performance.

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Chapter 1: Introduction

In 1999, the California legislature passed and Governor Davis signed a bill (SB-2X) establishing the California High School Exit Exam (CAHSEE). The bill required the Superintendent to appoint a High School Exit Exam content panel to recommend content requirements for the exam that students, beginning with the Class of 2004, would have to pass to receive a high school diploma in California. This panel recommended content requirements in English language arts (ELA) and mathematics (Math) that students should be required to master for high school graduation. In fall 2000, the California State Board of Education (SBE) approved test blueprints indicating the number of test questions for each content standard to be included in each test form and the CAHSEE was first administered operationally in spring 2001 to 9th graders in the Class of 2004.

The legislature subsequently passed another bill (AB-1609) requiring a study of whether the validity of the test and the quality of instruction were sufficient to support the new graduation requirement. The bill also authorized the SBE to defer implementation of the requirement and, in July 2003, the SBE did defer the requirement until the Class of 2006. Subsequently, the Board also adopted minor changes in the test blueprints.

The legislation establishing the CAHSEE also called for an independent evaluation of the impact of the new graduation requirement. In January 2000, a contract for this evaluation was awarded to the Human Resources Research Organization (HumRRO). The contract required annual reports to the California Department of Education (CDE) in addition to a Spring 2000 report and biennial reports beginning in February 2002 to the governor, state legislature, and the SBE. Copies of the evaluation reports to date are available on the CDE website (see <http://www.cde.ca.gov/ta/tg/hs/evaluations.asp>). The original evaluation contract was amended to include the study of the test and of instruction called for in AB-1609 (see above). That report (Wise, et al., May 2003) is also available at the same CDE website.

In 2001, Congress passed, and in January 2002 the President signed, the No Child Left Behind (NCLB) Act requiring states to implement assessments for grades 3 through 8 and in high school for measuring annual yearly progress toward the goal that all students at each grade would meet proficiency targets by 2014. In fall 2000, CDE recommended and the SBE adopted the use of the CAHSEE as the high school accountability measure required under NCLB. In doing so, the SBE set a higher target for the level of proficiency students would be required to meet than was set previously for the graduation requirement. Meeting the graduation requirement was considered to signify basic mastery of the required content. Higher levels were set for demonstrating proficient and advanced performance.

The content standards recommended by the HSEE panel are cumulative and include some skills that are introduced initially at earlier grades. To make sure that the CAHSEE provided an appropriate measure for high school accountability, the CDE

asked HumRRO, as the independent evaluator, to build on its prior reviews of the CAHSEE and evaluate the use of the CAHSEE for high school accountability. This report documents the results of that review.

HumRRO's evaluation of the use of the CAHSEE for high school accountability started with a review of how the content standards for the CAHSEE were established initially. This review is described in Chapter 2. Chapter 3 describes the high school content comparison workshops conducted by HumRRO to compare the range and depth of the CAHSEE standards with the content standards of high school accountability assessments from other states considered to be exemplary. In response to suggestions that California's existing high school end-of-course assessments could be used as the high school accountability measure for NCLB, Chapter 4 provides a comparison of the CAHSEE content standards to the standards from California's existing high school end-of-course tests. This report concludes with a summary of the main findings from our review and considerations for future enhancements of the CAHSEE content standards.

Chapter 2: Development of the CAHSEE Content Standards

The High School Exit Exam Panel

The legislation establishing the CAHSEE called for an independent panel to recommend content standards that students should be required to master for high school graduation. Specifically, as enacted into California's education code (EC) the legislation stated:

60850. (b) The Superintendent of Public Instruction, with the approval of the State Board of Education, shall establish a High School Exit Examination Standards Panel to assist in the design and composition of the exit examination and to ensure that the examination is aligned with statewide academically rigorous content standards. Members of the panel shall include, but are not limited to, teachers, administrators, school board members, parents, and the general public. Members of the panel shall serve without compensation for a term of two years and shall be representative of the state's ethnic and cultural diversity and gender balance. The superintendent shall also make the best effort to ensure representation of the state's diversity relative to urban, suburban, and rural areas. The State Department of Education shall provide staff to the panel.

Following provisions in the legislation, a panel of teachers, principals, school board members, parents, and the general public was appointed by the Superintendent and approved by the Board. The panel first met in July 1999 and continued to meet frequently over the next year and a half, through January 2001. In December 1999, the panel transmitted an interim report to the California Superintendent of Public Instruction describing their thoughts regarding the alignment of test content to California's existing academic content standards. In this report, the panel states:

"Our Guiding Ideas. The law requires that the exam be aligned to the state's recently adopted standards for reading/language arts and mathematics. It does not specify which standards. Consequently, the Panel believed one of its first tasks was to ask the question, "Which standards must be mastered as a condition for receiving a high school diploma?" That is a very different question than one which asks about standards based on subject or grade level issues. Those questions have already been asked and answered.

The Panel also recognized that the standards are voluntary and are not intended to reflect the sum total of all the learning expected of California's diverse student population. Nor are they intended to support one pedagogical approach over another. Therefore, the Panel believes that it asked the right question—given the high stakes nature of this test—when it asked which standards must be met as a condition of receiving a diploma.

The Panel was driven by a series of guiding principles. A copy of these is provided for your review (Refer to Attachment A). They are important because they influenced the Panel's deliberations and decisions. Suffice it to mention that these principles established the importance of high expectations for student achievement (well beyond those reflected in most "minimum proficiency" tests), noted actions needed to implement a more rigorous curriculum for all California students, states that initial large failure rates are not desired, and reflected interest in strengthening the exam over time through inclusion of additional standards and higher passing scores.

The ELA Standards. *In reading/language arts, the Panel believed that the first exit examination should generally reflect the knowledge and skills included in the standards for grades K-8, always emphasizing the highest level of the standards, and the standards for Grades 9 and 10. As the Panel reviewed the 9th and 10th grade standards, it concluded that while most should be included, a few standards should not be included because they were not viewed as a critical prerequisite for a high school diploma, at least in the test's first version.*

The Panel also asked whether any of the 11th or 12th grade standards were essential for a high school diploma. The answer was in the affirmative. An example would be an 11th grade standard which relates to a preparation of a resume and job application. As the Panel reviewed these standards, it only included elements of the standards which students should master before achieving a diploma.

Before you or others make a final decision about these standards, we request that the standards themselves be reviewed carefully. It seems insufficient to us to make decisions about standards solely based on grade level issues without consideration of the knowledge and skills these standards address.

The Panel believes that there should be a second version of this test to be phased in which includes many more of the 11th and 12th grade standards since the exam should reflect the totality of the high school reading/language arts experience. This second version should look more closely like end of course exams given in Virginia and New York. We believe the Class of 2007 should be considered for such a test.

The Mathematics Standards. *In mathematics, the Panel examined closely the new standards which reflect a considerably higher level of achievement than that expected in the past. The Panel concluded that algebra, geometry, probability and statistics and other topics should all be included in the exam. However, because of significant issues related to current curriculum requirements (the state itself requires only two years of high school mathematics), the voluntary nature of the standards, the need for extensive professional development, and the availability of qualified teachers, these subjects should be phased in over two periods of time.*

The Panel believes the initial exam should include two sections. The first reflects the areas of algebra, geometry, arithmetic, and probability and statistics that are reflected in the 7th grade standards. The recommended standards which are attached. [Refer to Attachment B] The second section reflects the need for algebra. In this sense, the Panel concurs with the Governor and you that algebra must be part of a student's K-12 educational experience. The standards recommended are ones that are taught in a variety of algebra courses, including traditional algebra, CPM, and integrated math. They reflect a rigorous and challenging algebra program, but also provide teachers the time and flexibility to address additional standards in ways that best work for the students. In this sense, they are consistent with the differentiated algebra standards included in the new math framework which has been approved by the State Board." (HSEE Panel, Dec. 3, 1999)

The Panel provided more complete content recommendations in March 2000. Along with those recommendations, they addressed questions about including mathematics standards from earlier grades. Specifically, they stated:

"The California content standards for grades 6-Algebra I are organized by grade level and mathematics disciplines. The mathematics subgroup reviewed the standards all students are expected to master to graduate from high school. The recommended standards include grades 6 and 7 since these are the last grades in which some of the fundamental skills in mathematics are to be mastered." (HSEE Panel, March 2000).

The HSEE panel continued to meet through January 2001, considering many aspects of test administration and reporting and also revisions to their content recommendations.

Adoption by the State Board of Education

The SBE considered the HSEE panel's recommendations and also considered recommendations from CDE for minor modifications to the recommended test blueprint in mathematics. CDE was concerned with the overall length of the test and the degree of emphasis on Algebra, a course students had not previously been required to take for high school graduation. In fall 2000, the SBE approved test blueprints for the CAHSEE based on the HSEE panel's recommendations and the modifications recommended by CDE.

Note that the SBE did not adopt new content standards for the CAHSEE. The Board had previously developed and adopted the California Content Standards for each grade and subject. The test blueprints approved for the CAHSEE identified a subset of the California Content Standards to be covered by the CAHSEE and a specification as to the number of test questions for each content standard to be included in each CAHSEE test form.

Revision in 2004

In July 2003, the SBE approved a two-year deferral of the CAHSEE requirement. The primary concern was that a significant number of students were not yet ready to meet the requirement and that more time was needed to improve both initial and remedial instruction provided to students. The SBE also approved changes to the test blueprints, primarily to reduce testing time requirements from three days to two days. As noted in the minutes of this meeting (California State Board of Education, July 2003):

"The motion incorporated the proposed consolidation of the English-language arts portion of the CAHSEE such that it (1) can be administered in a single day and (2) will have a single essay item."

Chapter 3: High School Content Comparison Study

Introduction

The purpose of HumRRO's High School Content Comparison Study was to assess the appropriateness of the content standards being used for high school accountability in California. Workshop participants compared these California standards with standards used for high school accountability in other states that were considered to have exemplary content standards. Note that this study concerned the content standards and not the assessment itself. The alignment of the CAHSEE test questions with the content standards targeted for the CAHSEE was examined and reported in a separate effort (Wise, et al., 2005).

The following tasks comprised this study:

1. Selection of Comparison State Standards
2. Identify and Recruit Participants for the Content Comparison Workshop
3. Design and Conduct the Content Comparison Workshop
4. Analyze and Report Results

The methods and results of each of these tasks are described in the following sections.

Selection of Comparison States

Review of State Assessment Systems

Since its enactment in 2002, the federal No Child Left Behind Act (NCLB) has exerted tremendous impact on when and how states test, what grades and subjects they test, what kinds of tests they give, and how they use and report results. Beginning in school year 2005–06, the Act requires all students in grades 3 through 8 to be tested annually in reading and math and requires secondary school students to be tested at least once between grades 10 and 12 in these subjects. Testing in science will become a requirement for NCLB in 2007–08.

The Council of Chief State School Officers (CCSSO) reports on the state student assessments being used to meet NCLB requirements in core subjects. Information provided includes the name of the tests, grade levels in which they are administered, and the types of exams given (CCSSO, 2004a, 2004b). According to the CCSSO report as well as information from other general sources including documents of the American Federation of Teachers (AFT, 2001), all states test students at the three levels of elementary, middle school and high school in English and mathematics. The majority of the 50 states customize their NCLB assessment either in collaboration with a test publishing company or by a test company (CCSSO, 2004a, 2004b). The majority of these self-developed tests are either end-of-course exams or standards-based exams, both of which are criterion-referenced tests (CRT). Two states developed augmented norm-referenced tests for high school assessment. The remaining states use such nationally normed tests such as Stanford Achievement Test or Iowa Test of Educational Achievement, for high school accountability purpose.

To be specific, for the high school level, 36 states use standards-based tests to meet NCLB requirements (CCSSO on High School Assessment, n.d.). Seven states—Arkansas, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, and Virginia—use end-of-course tests as NCLB measures. Four states—District of Columbia, Hawaii, Iowa, and Missouri—use only off-the-shelf tests for NCLB accountability. Idaho and South Dakota use augmented norm-referenced assessment. Another three states use a combination of CRT and NRT assessment or a combination of end-of-course and standards-based assessments as NCLB measures. For example, Kentucky has Kentucky Core Content Test (CRT) at 11th grade, and CTBS/5 Survey Edition (NRT) at 9th grade level; South Carolina has both end of course measures and standards-based test. As for grades tested, 16 states administer examinations in 9th grade, 32 states in 10th grade, 21 states in 11th grade and five states in 12th grade.

According to a report by the Center on Education Policy (CEP) report in 2004, 20 states required students to pass an exit exam to graduate from high school. Five more states plan to phase in exit exams by 2009. Among the 25 states with current or planned exit exams, 17 states are using or plan to use standards-based exams. Four states (Maryland, Mississippi, New York, and Virginia) use end-of-course tests. Another four states—Arkansas, Minnesota, New Mexico, and Utah—use minimum competency exams. In the same report, CEP surveyed states regarding the alignment between their exit exams and standards. Minnesota and New Mexico, both with minimum competency exams, were the only states that reported their exit exams are not aligned to state standards. All other states reported that their exit exams are aligned to state standards, but the grade levels to which these exams are aligned vary (see Figure 3.1). The majority of states indicated their exit exams are aligned to grade 10 or 11 standards.

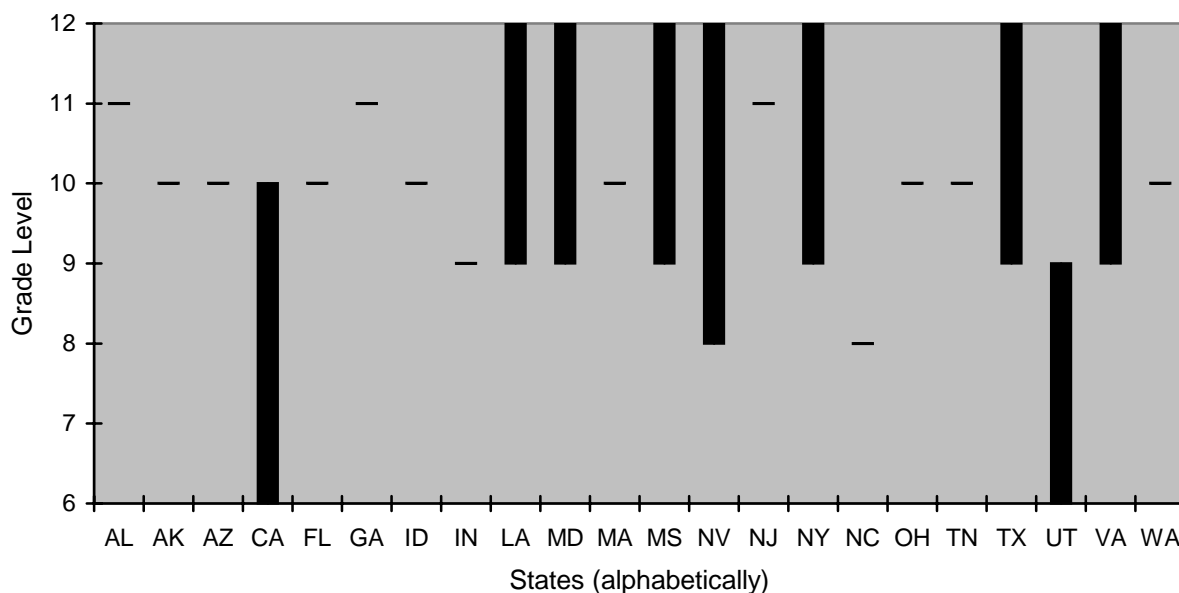


Figure 3.1 Grade level standards to which exit exams are aligned.

Among the 25 states with current or planned exit exams, 19 states are using or plan to use the same exams for both NCLB accountability and high school graduation. Ten of the 19 states are using or intend to use the same cut scores for both purposes. Of the six states that use different tests for graduation and NCLB, Minnesota, New Mexico, and Utah administer minimum competency exams that do not meet the requirements of NCLB. Minnesota and New Mexico's exit exams are not aligned to state standards. Utah's exit exams are aligned to standards for grades 6–9, which is likely the reason these exams are not used for NCLB accountability. North Carolina's exams are aligned to 8th grade standards and cannot be used for NCLB accountability. Texas has a 10th grade and an 11th grade exam. The 10th grade exam is used for NCLB, and the 11th grade exam is used for graduation. Maryland's exam will not count for graduation purposes until 2009.

Rationale Used to Sample State Standards

We sought to compare the standards assessed by the California High School Exit Exam (CAHSEE) with the best available models of state standards that have been recognized for their quality. To this end, we selected states whose standards have either received high marks from *Education Week's* Quality Counts report (*Education Week*, 2005b) and AFT (2001), or were used as benchmark standards by Achieve (Achieve, n.d.). In addition, the selected states have different types of high school accountability measures (CCSSO, 2004a, 2004b), in that some were graduation tests and others were not.

Education Week graded states in many aspects, based on the responses they collected from their annual policy survey (*Education Week*, 2005a). In regard to standards and accountability, *Education Week* ranks the states and the District of Columbia by their adoption of standards, the quality of standards, assessment, and accountability indicators—report cards, ratings, assistance, sanctions, and rewards. The quality of standards is defined as whether the standards are clear, specific, and grounded in academic content, similar to the AFT's criteria of strong standards (AFT, 2001). The AFT rated state standards in the four core subjects (English, mathematics, science and social studies/history) in each of three grade spans—elementary, middle, and high school (AFT, 2001). The AFT has a series of criteria to determine the quality of content standards, including whether the standards are detailed, explicit and firmly rooted in the content (see Appendix F). Achieve is a non-profit organization that has conducted several studies on assessing state standards and tests. Achieve develops its criteria for standards and assessment which include a set of “benchmark” standards from highly regarded states and nations to compare state standards to, to judge whether the standards are clear, specific, rigorous and teachable (Achieve, n.d.). The mathematics benchmark standards that Achieve uses include the American Diploma Project (ADP) mathematics benchmarks (see Appendix G), as well as Achieve's end-of-grade-8 expectations, *Foundations for Success*, and grade-level standards for K–8. In addition, Achieve uses benchmarks from Singapore and Indiana, as well as from Massachusetts and Ohio. The ELA benchmark standards that Achieve uses include the ADP English benchmarks (see Appendix H), California and Massachusetts, as well as the early literacy standards of North Carolina, Texas and New Standards.

States were included in the Comparison study because they demonstrated: (1) exemplary standards documents, (2) the existence of high school standards, and (3) the use of these standards for accountability purposes. Nine states were initially selected for comparison, based on the above rationale. The content standards for seven states—Massachusetts, Ohio, West Virginia, Florida, New York, Louisiana and South Carolina—were selected as benchmark standards for mathematics. The content standards for the states of Massachusetts, Ohio, West Virginia, Florida, New York, Louisiana, as well as North Carolina and Texas, were selected as benchmark standards for English-language arts. Among the 9 states, 7 states (Massachusetts, Ohio, West Virginia, Florida, New York, Louisiana, South Carolina) are graded *A* from *Education Week* for their standards and accountability across subjects and grade levels (*Education Week*, 2005b). North Carolina receives a *B* in the quality count, and Texas a *C+*. However, the standards in math and ELA for North Carolina and Texas are judged by *Education Week* as clear, specific and grounded in content. Standards for all the 9 states meet the AFT criteria for strong standards (AFT, 2001). ELA standards of Massachusetts, North Carolina and Texas are used by Achieve as benchmark standards for English language arts (Achieve, n.d.). Math standards for Massachusetts and Ohio are used as benchmark standards for math.

As for type of tests, the majority of the states have standards-based tests, while tests of New York and South Carolina are end-of-course exams (CCSSO, 2004a, 2004b). North Carolina has multiple NCLB measures of various types at the high school level, including standards-based, end-of-course and norm-referenced. Five states (Massachusetts, Ohio, Florida, New York and Texas) have exit exams, all of which, except for Texas, use exit exams for both graduation purpose and NCLB accountability.

Four states, i.e., North Carolina, South Carolina, Texas and West Virginia, have gone through NCLB standards and assessment peer review (U.S Department of Education, n.d.). The standards and assessment systems for North Carolina, South Carolina and West Virginia meet most, but not all, of the Elementary and Secondary Education Act (ESEA) statutory and regulatory requirements, and thus have been granted deferred approval. Texas was offered Final Review Pending of its assessment system, because its standards and assessment system does not meet most of ESEA's statutory and regulatory requirements.

Table 3.1 summarizes the main features of the standards and tests of these states. It lists the status of each test in terms of the rationale described above.

Table 3.1 Some Major Features of the 9 State Standards and Tests

States	<i>EdWeek</i> overall grade for standards and accountability	Meet the AFT criteria for strong standards	Used as Achieve benchmark standards?	Type of Test	Has Exit Exam	Use Exit Exam For NCLB	NCLB Standards and Assessment (Peer review)
Massachusetts	A	Yes	ELA & Math	Standards-based	Yes	Yes	Deferred approval
Ohio	A	Yes	Math only	Standards-based	Yes	Yes	
West Virginia	A	Yes	No	Standards-based,	No	No	
Florida	A	Yes	No	Standards-based	Yes	Yes	
New York	A	Yes	No	EOC	Yes	Yes	Deferred approval
Louisiana	A	Yes	No	Standards-based,	No	No	
South Carolina	A	Yes	No	EOC	No	No	Deferred approval
North Carolina	B	Yes	ELA only	EOC, Standards-based, NRT	No	No	Deferred approval
Texas	C+	Yes	ELA only	Standards-based	Yes	N/A	Final review pending

Identify and Recruit Participants for the Content Comparison Workshop

Twenty-four Kentucky teachers and curriculum specialists (not affiliated with the state of California or any of the other states included in this study) served as independent reviewers. These teachers were selected based on their experience level with teaching in general and with standards development and review for Kentucky. Table 3.2 presents the distribution of reviewers by content area and current position. Table 3.3 indicates the years of experience for these panelists.

Table 3.2 Panelists by Content Area and Current Position

Current position	English-language arts panelists	Mathematics panelists
Teacher, regular classroom	10	9
Teacher, special education	1	2
Curriculum Specialist	1	1
Total	12	12

Table 3.3 Experience Level of Panelists

Years Experience	ELA	Mathematics
Less than 5 years	1	0
5 – 9 years	3	1
10 – 19 years	6	10
20 or more years	2	1
Total	12	12

Data Collection Forms and Procedures

Reviewers evaluated the content match between the CAHSEE standards and several other state high school standards along with the depth of knowledge required by these standards.

State Standards Documents. The organization of the standards documents varied slightly, as shown by some differences in the number of standards (content categories) and objectives (specific content expectations) per state. Many of these states also use the high school assessment affiliated with the standards as a graduation requirement. The specific states included in the standards review are listed in Table 3.4. Note that content standards from one of the originally selected states, Louisiana, were used as practice items to train the workshop participants; they were not included in the operational activities.

Table 3.4 State Content Standards Characteristics: High School Graduation Requirement, Number of Content Standards, and Objectives per Content Area

Content Area	States	High School Exit Exam	Number of Content Standards	Number of Content Objectives
English-language arts	California	Yes	6	32
	Massachusetts	Yes	4	46
	North Carolina	Yes	6	18
	New York	Yes	4	36
	South Carolina	Yes	5	27
	Texas	No	6	21
	West Virginia	No	3	37
Mathematics	California	Yes	7	53
	Florida	Yes	5	30
	Massachusetts	Yes	5	30
	New York	Yes	7	45
	Ohio	Yes	6	53
	South Carolina	Yes	4	56
	West Virginia	No	5	25

The official content standards for each state were retrieved online from the state's website. These public documents reflect the current content included in the curriculum and evaluated on the grade level assessments.

Content Cards. The ELA and mathematics standards for each state included in the study were split into smaller segments at the level of the content objectives¹. Each content objective per standard was listed separately on a 5 x 7 inch index card. Cards included rating scales to evaluate the content objectives on depth-of-knowledge level and item quality. In addition, reviewers wrote down category labels on the card to indicate whether the content matched any of the other standards and objectives they evaluated.

Card Decks. To maximize the number of comparison states without overly fatiguing workshop participants, two card decks were prepared for ELA and two card decks were prepared for mathematics. Each deck included all California standards and all standards from three additional states. States were distributed across the two decks to roughly balance the number of cards per deck. Each participant processed a single deck, identified as either Deck A or Deck B.

Within each deck, standards were randomly ordered. Individual states were not identified. A four-digit workshop identification number was assigned to each standard and printed on the cards to facilitate subsequent analyses.

Task Instructions. To perform the comparison task, reviewers received a copy of the Alignment Instructions and Definitions sheet. This sheet explained how to use

¹ The content objectives reflect the most specific academic knowledge and performance tasks expected of students by the state.

each rating form with several examples. The instructions also included definitions for each depth-of-knowledge (DOK) level (shown in Table 3.5) and for clarity ratings (shown in Table 3.6).

Table 3.5 Depth of Knowledge Levels from Comparison Instructions Sheet

DOK Level	Title	Description
Level 1	Recall	Item requires simple recall of information, such as facts, definition, terms, or procedures.
Level 2	Skills/Concepts	Item calls for engagement in some mental processing and decisions beyond habitual response.
Level 3	Strategic Thinking	Item requires students to reason, plan, and use evidence.
Level 4	Extended Thinking	Item requires complex reasoning, planning, and thinking, typically over an extended period of time.

Table 3.6 Content Objective Clarity Ratings from Comparison Instructions Sheet

Clarity Level	Description
Level 1	Clear in purpose and specific.
Level 2	Not clear in purpose.
Level 3	Too general.
Level 4	Other (please explain).

Debriefing Form. Reviewers completed a debriefing survey at the end of the Comparison tasks. This survey requested reviewers' overall impressions of the degree of similarity in a series of four questions (see Appendix B).

Procedures

The workshop began with an introduction of staff and observers. HumRRO staff gave a brief presentation on the purpose of the workshop and the tasks reviewers would perform.

Reviewers then moved to different rooms, one group with ELA reviewers and one group with mathematics reviewers. A HumRRO staff member facilitated each group by discussing rating procedures in more detail, training reviewers with sample content cards, and answering questions about the tasks. Reviewers were told that they would be receiving content cards for six states, including California, but they would not be able to identify the state from the cards.

As part of the matching process, reviewers were instructed to sort the cards into piles in two stages based on their content similarity. First, reviewers were asked to sort cards into piles based on the overall category match, which they did primarily by evaluating the standard title on the card. Second, reviewers performed a more in-depth content evaluation by sorting each card pile further into subcategories. In this sort, reviewers worked on the card decks from their first sort to place similar content objectives into groups. As a result, reviewers then had smaller content groups within the major category they created. If reviewers found a single content objective that did not fit into any other subcategories, they were instructed to count this objective as ‘Unique.’ In this case, the objective represented a content expectation that was not found in any other state. Reviewers were trained to apply a common label to all of the cards in the same content piles to indicate their similarity. Reviewers applied a category letter to similar cards in the first sort and numbers to cards in the second sort. Unique content cards received distinct labels.

In addition to content matching, reviewers were asked to rate the content objective on the card for depth of knowledge (DOK) and clarity. For DOK, reviewers indicated their ratings by writing in the appropriate level (1, 2, 3, or 4). For clarity ratings, reviewers marked an ‘X’ next to the statement that best reflected their evaluation of the degree of clarity evident in the content objective.

Reviewers practiced rating and matching cards with a sample set by performing independent evaluations, followed by a group discussion to reach a common understanding of each of the tasks to be performed. The content standards and states used in this practice exercise were not used in the operational phase of the review.

During the operational review period, HumRRO staff provided general suggestions and comments when appropriate; however, they emphasized to reviewers that staff would not give explicit direction on how to rate or match the standards because reviewers were valued as content experts. Reviewers proceeded to perform the comparison tasks on the target states. Reviewers worked independently throughout the time they sorted and rated cards until they completed the tasks.

Upon completing the comparison tasks, reviewers provided written feedback on their overall judgments about the similarity of the standards across states and on the processes used in the workshop. In addition, reviewers provided verbal feedback beyond the survey in their separate content areas. The discussion concluded the workshop.

Results

Common Content Clusters

The first step in analyzing the workshop data was to identify common content clusters for the mathematics and ELA objectives. Each state has organized their content standards into two or more levels – content strands (here referred to as standards) and specific content objectives within each of the content strands. To compare the content coverage of different states, a common way of grouping objectives was needed.

Each of our panelists carried out two content matching steps. The first was to sort the objective description cards into major groups. The second was to sort the cards within each of these major groups into subgroups and to identify any objectives that were truly unique. We used their results to define a similarity measure for each pair of objectives in a given deck. The idea is that if a panelist placed two objectives in the same major group, the objectives were at least somewhat similar. If the panelist placed them in the same subgroup, they must have been very similar. For each panelist, we scored the similarity of a pair of objectives as 1 if the panelist placed them in the same major group and then added another 3 [check] points if the panelist placed them in the same subgroup. The overall similarity score for each pair was the sum of the similarity scores across the 6 panelists who provided ratings for a particular deck of objectives.

We used these similarity measures to perform a hierarchical cluster analysis. Each objective in a deck was initially in a separate cluster. At each step we combined the two clusters (initially the two objectives) that had the highest similarity rating. As two clusters were combined, we recomputed the similarity of each other cluster with the new cluster by taking the average of the other cluster's similarity with the two clusters being combined. When the two clusters being combined had unequal numbers of objectives, we computed a weighted average of the similarity of the other cluster with the two clusters being combined, using the number of objectives in each of the clusters being combined as weights. This process continued until the similarity of the remaining clusters was judged relatively low.

We examined the maximum similarity measures at each stage of the hierarchy and selected two different stopping points where going further would mean combining clusters that were relatively less similar. The first stopping point yielded 12-16 lower-level clusters (referred to here as subclusters). We then continued combining these subclusters until we reached a second stopping point, thus grouping the subclusters into 4 or 5 major content clusters.

The hierarchical clustering resulted in a two-level clustering of objectives in each of the two decks (sets of comparison states). The California content standards were included in both decks, and we used their placement to match the cluster solutions from the two separate decks.

After developing an initial set of overall content clusters for each subject, we brought back two ELA and two mathematics panelists to review the initial content clusters. The panelists provided descriptive titles for each cluster and subcluster and suggested shifts in specific cluster assignments to improve the clarity of the results. HumRRO staff also participated in final decisions about cluster names and assignments. Appendix A provides a complete listing of each of the content objectives from each state that were reviewed by the panelists. The content objectives are grouped by their final cluster and subcluster assignments.

Comparison of State Coverage of Content Clusters

English Language Arts

Table 3.7 shows the distribution of content objectives from each state across the common ELA content clusters. The top half of the table, labeled “Percent of Cluster,” reports the distribution of content objectives among subclusters within each cluster. For example, California has two objectives under the Word Skills cluster and Massachusetts has five. Inspection of the assignment of these objectives to subclusters reveals that 20 percent of Massachusetts’s objectives measure Word Reference and 80 percent measure Vocabulary, while 100 percent of California’s objectives assess Vocabulary.

The bottom half of Table 3.7 indicates the distribution of ELA content standards among clusters and subclusters as a percentage of all standards. For example, the same four objectives defining California’s Word Skills cluster comprise 6 percent of all ELA standards. In Massachusetts, the Word Skills cluster accounts for 11 percent of all ELA standards.

Table 3.7 provides many possible comparisons. Of particular relevance to this cross-state comparison of content coverage are subclusters which California addresses to a lesser extent than the comparison states. Four subclusters have no California standards assigned to them:

- Word Reference
- Presentation Skills
- Media
- Cultural Communication

Each of these subclusters is absent in at least two comparison states, as well; thus this is not a distinct omission by California of generally-accepted areas.

Table 3.7 Distribution of ELA Objectives Among Clusters and Subclusters, by State

Content Cluster and Subcluster	Statistic	State						
		CA	MA	NC	NY	SC	TX	WV
<i>Percent of Cluster</i>								
1. Word Skills	Number of Objectives	2	5			4	2	5
1.1 Vocabulary	Percent of Objectives	100%	80%			75%	100%	100%
1.2 Word Reference	Percent of Objectives	0%	20%			25%	0%	0%
2. Reading	Number of Objectives	16	14	10	18	12	8	8
2.1 Comprehension	Percent of Objectives	19%	21%	0%	39%	50%	13%	50%
2.2 Literature	Percent of Objectives	25%	21%	10%	22%	0%	37%	37%
2.3 Analysis and Criticism	Percent of Objectives	19%	36%	90%	33%	50%	0%	0%
2.4 Structural Elements	Percent of Objectives	37%	21%	0%	6%	0%	50%	13%

(Table continued)

Content Cluster and Subcluster	Statistic	State						
		CA	MA	NC	NY	SC	TX	WV
3. Writing	Number of Objectives	12	16	4	13	7	9	18
3.1 Writing Applications	Percent of Objectives	58%	44%	50%	92%	71%	22%	11%
3.2 Writing Conventions	Percent of Objectives	33%	44%	25%	0%	0%	22%	61%
3.3 Writing Strategies	Percent of Objectives	8%	12%	25%	8%	29%	56%	28%
4. Communication	Number of Objectives	1	11	4	5	4	2	6
4.1 Presentation Skills	Percent of Objectives	0%	55%	75%	60%	0%	0%	83%
4.2 Research	Percent of Objectives	100%	9%	0%	0%	100%	0%	0%
4.3 Media	Percent of Objectives	0%	36%	0%	20%	0%	100%	17%
4.4 Cultural Communication	Percent of Objectives	0%	0%	25%	20%	0%	0%	0%
Total	Number	31	46	18	36	27	21	37
Percent of Total								
1. Word Skills	Percent of Objectives	6%	11%	0%	0%	15%	10%	14%
1.1 Vocabulary	Percent of Objectives	6%	9%	0%	0%	11%	10%	14%
1.2 Word Reference	Percent of Objectives	0%	2%	0%	0%	4%	0%	0%
2. Reading	Percent of Objectives	52%	30%	56%	50%	44%	38%	22%
2.1 Comprehension	Percent of Objectives	10%	6%	0%	20%	22%	5%	11%
2.2 Literature	Percent of Objectives	13%	6%	6%	11%	0%	14%	8%
2.3 Analysis and Criticism	Percent of Objectives	10%	11%	50%	17%	22%	0%	0%
2.4 Structural Elements	Percent of Objectives	19%	6%	0%	3%	0%	19%	3%
3. Writing	Percent of Objectives	39%	35%	22%	36%	26%	43%	49%
3.1 Writing Applications	Percent of Objectives	22%	15%	11%	33%	18%	9%	5%
3.2 Writing Conventions	Percent of Objectives	13%	15%	6%	0%	0%	9%	30%
3.3 Writing Strategies	Percent of Objectives	3%	4%	6%	3%	8%	24%	14%
4. Communication	Percent of Objectives	3%	24%	22%	14%	15%	10%	16%
4.1 Presentation Skills	Percent of Objectives	0%	13%	17%	8%	0%	0%	13%
4.2 Research	Percent of Objectives	3%	2%	0%	0%	15%	0%	0%
4.3 Media	Percent of Objectives	0%	9%	0%	3%	0%	10%	3%
4.4 Cultural Communication	Percent of Objectives	0%	0%	6%	3%	0%	0%	0%

Note. All totals subject to rounding.

Figure 3.2 provides the cluster-level information in a graphical format to facilitate comparison across states. Inspection of these pie charts reveals that California devotes a greater percentage of its ELA content standards to Reading (52%) than all comparison states with the exception of North Carolina (56%). On the other hand, California allots only 3 percent of its ELA content standards to Communication—less than any of the comparison states. Interestingly, West Virginia has a heavier emphasis on Writing (49%) than Reading (22%).

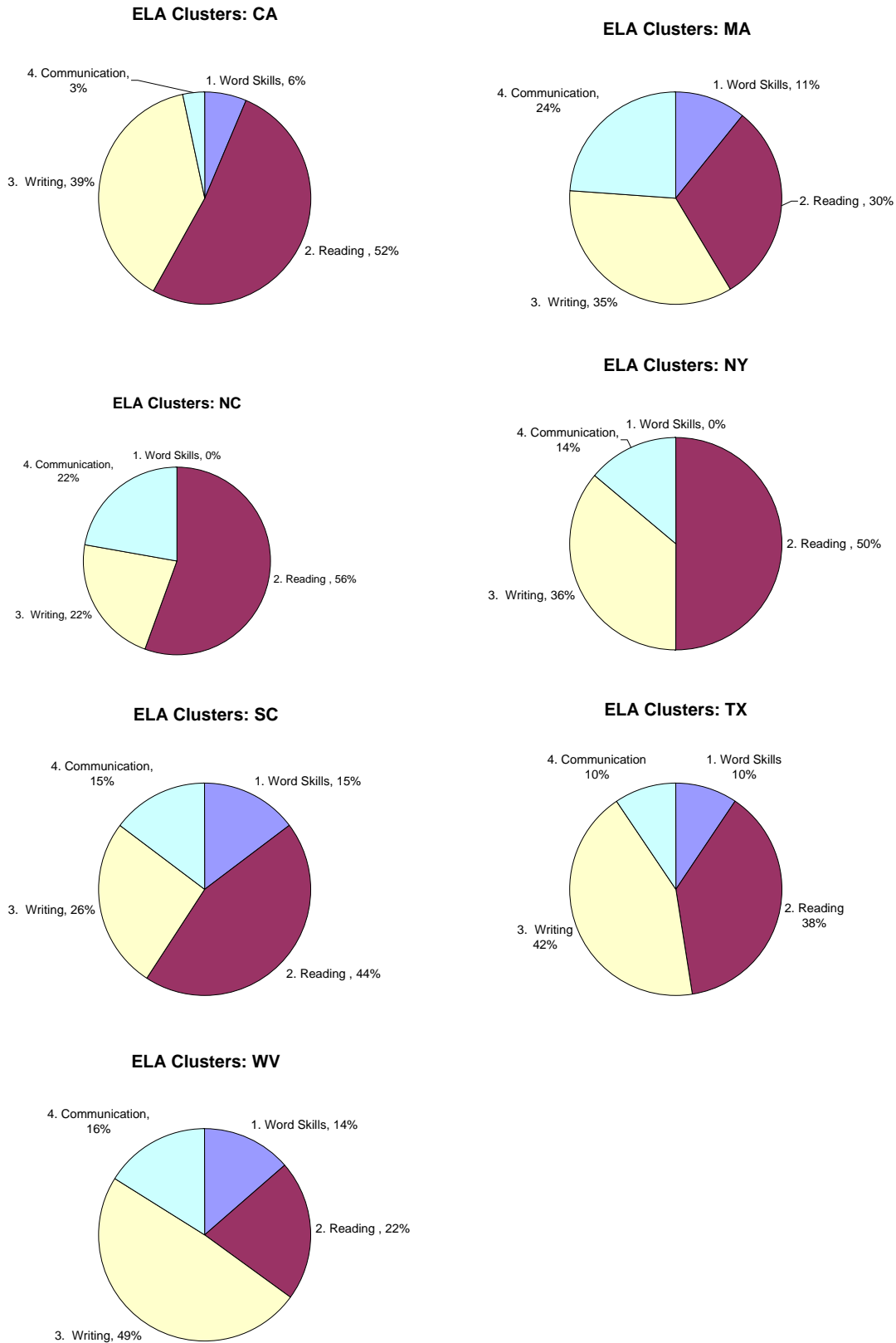


Figure 3.2 Distribution of ELA Objectives Among Clusters, by State

Mathematics

Table 3.8 shows the distribution of content objectives from each state across the common mathematics content clusters. The top half of the table, labeled “Percent of Cluster,” reports the distribution of content objectives among subclusters within each cluster. For example, California has 12 objectives under the Number Sense cluster and Florida has seven. Inspection of the assignment of these objectives to subclusters reveals that 25 percent of California’s Number Sense objectives measure Number Properties, compared to 72 percent of Florida’s.

The bottom half of Table 3.8 indicates the distribution of Math content standards among clusters and subclusters as a percentage of all standards. For example, the same 12 objectives defining California’s Number Sense cluster comprise 23 percent of all Math standards. In Florida, the seven objectives in the Number Sense cluster account for 25 percent of all Math standards. This may indicate that the California standards are described at a more precise level than the Florida standards, but represent comparable weight in the two states.

Table 3.8 Distribution of Math Objectives Among Clusters and Subclusters, by State

Content Cluster and Subcluster	Statistic	CA	FL	MA	State NY	OH	SC	WV
Percent of Cluster								
1. Number Sense	Number of Objectives	12	7	4	3	4	12	3
1.1 Number Properties	Percent of Objectives	25%	72%	100%	100%	57%	58%	33%
1.2 Number Operations	Percent of Objectives	58%	14%	0%	0%	43%	25%	67%
1.3 Estimation	Percent of Objectives	17%	14%	0%	0%	0%	17%	0%
2. Algebra	Number of Objectives	18	4	9	8	9	18	7
2.1 Equations	Percent of Objectives	44%	25%	33%	25%	22%	33%	71%
2.2 Monomials and Polynomials	Percent of Objectives	17%	0%	33%	25%	11%	11%	0%
2.3 Patterns and Functions	Percent of Objectives	0%	75%	11%	25%	33%	28%	0%
2.4 Graphs of Functions	Percent of Objectives	39%	0%	22%	25%	33%	28%	29%
3. Measurement and Geometry	Number of Objectives	10	11	13	17	16	15	10
3.1 Measurement	Percent of Objectives	30%	36%	15%	29%	19%	13%	20%
3.2 Geometric Properties	Percent of Objectives	20%	9%	23%	47%	37%	33%	40%
3.3 Geometric Problems	Percent of Objectives	50%	55%	62%	24%	44%	53%	40%
4. Data and Statistics	Number of Objectives	7	6	3	6	10	11	4
4.1 Statistical Properties	Percent of Objectives	14%	33%	0%	17%	20%	9%	50%
4.2 Probability	Percent of Objectives	43%	33%	0%	50%	20%	46%	50%
4.3 Graphs and Displays	Percent of Objectives	29%	17%	33%	33%	20%	9%	0%
4.4 Correlation & Best Fit	Percent of Objectives	0%	0%	33%	0%	0%	36%	0%

(Table continued)

Content Cluster and Subcluster	Statistic	CA	FL	MA	State NY	OH	SC	WV
4.5 Design/Interpret Experiments	Percent of Objectives	14%	17%	33%	0%	40%	0%	0%
5. Mathematical Thinking	Number of Objectives	5	2	1	11	11	1	1
5.1 Math Reasoning	Percent of Objectives	60%	0%	0%	82%	27%	0%	0%
5.2 Generalization	Percent of Objectives	40%	50%	0%	0%	18%	0%	100%
5.3 Math Communication	Percent of Objectives	0%	50%	100%	18%	55%	100%	0%
Total	Number	52	28	29	34	39	56	24
Percent of Total								
1. Number Sense	Percent of Objectives	23%	25%	14%	9%	10%	21%	13%
1.1 Number Properties	Percent of Objectives	6%	18%	14%	9%	6%	12%	4%
1.2 Number Operations	Percent of Objectives	13%	4%	0%	0%	4%	5%	8%
1.3 Estimation	Percent of Objectives	4%	4%	0%	0%	0%	4%	0%
2. Algebra	Percent of Objectives	35%	14%	31%	24%	23%	32%	29%
2.1 Equations	Percent of Objectives	15%	4%	10%	6%	5%	11%	21%
2.2 Monomials and Polynomials	Percent of Objectives	6%	0%	10%	6%	3%	4%	0%
2.3 Patterns and Functions	Percent of Objectives	0%	11%	3%	6%	8%	9%	0%
2.4 Graphs of Functions	Percent of Objectives	14%	0%	7%	6%	8%	9%	8%
3. Measurement and Geometry	Percent of Objectives	19%	39%	45%	50%	41%	27%	42%
3.1 Measurement	Percent of Objectives	6%	14%	7%	15%	8%	3%	8%
3.2 Geometric Properties	Percent of Objectives	4%	4%	10%	24%	15%	9%	17%
3.3 Geometric Problems	Percent of Objectives	10%	22%	28%	12%	18%	14%	17%
4. Data and Statistics	Percent of Objectives	13%	21%	10%	18%	26%	20%	17%
4.1 Statistical Properties	Percent of Objectives	2%	7%	0%	3%	5%	2%	8%
4.2 Probability	Percent of Objectives	6%	7%	0%	9%	5%	9%	8%
4.3 Graphs and Displays	Percent of Objectives	4%	4%	3%	6%	5%	2%	0%
4.4 Correlation and Best Fit	Percent of Objectives	0%	0%	3%	0%	0%	7%	0%
4.5 Design/Interpret Experiments	Percent of Objectives	2%	4%	3%	0%	10%	0%	0%
5. Mathematical Thinking	Percent of Objectives	10%	7%	3%	32%	28%	2%	4%
5.1 Math Reasoning	Percent of Objectives	6%	0%	0%	27%	8%	0%	0%
5.2 Generalization	Percent of Objectives	4%	4%	0%	0%	5%	0%	4%
5.3 Math Communication	Percent of Objectives	0%	4%	3%	6%	16%	2%	0%

Note. All totals subject to rounding.

Five of the subclusters are worth noting with respect to differences between California and the comparison states. Three subclusters have no California standards assigned to them:

- Patterns and Functions
- Correlation and Best Fit
- Math Communication

On the other hand, two subclusters have a greater percentage of California standards than any of the comparison states:

- Number Operations
- Graphs of Functions

Figure 3.3 provides the cluster-level information in a graphical format to facilitate comparison across states. Inspection of these pie charts reveals that California devotes a greater percentage of its math content standards to Algebra (35%) than any comparison states. On the other hand, California allots only 19 percent of its math content standards to Measurement and Geometry—less than any of the comparison states.

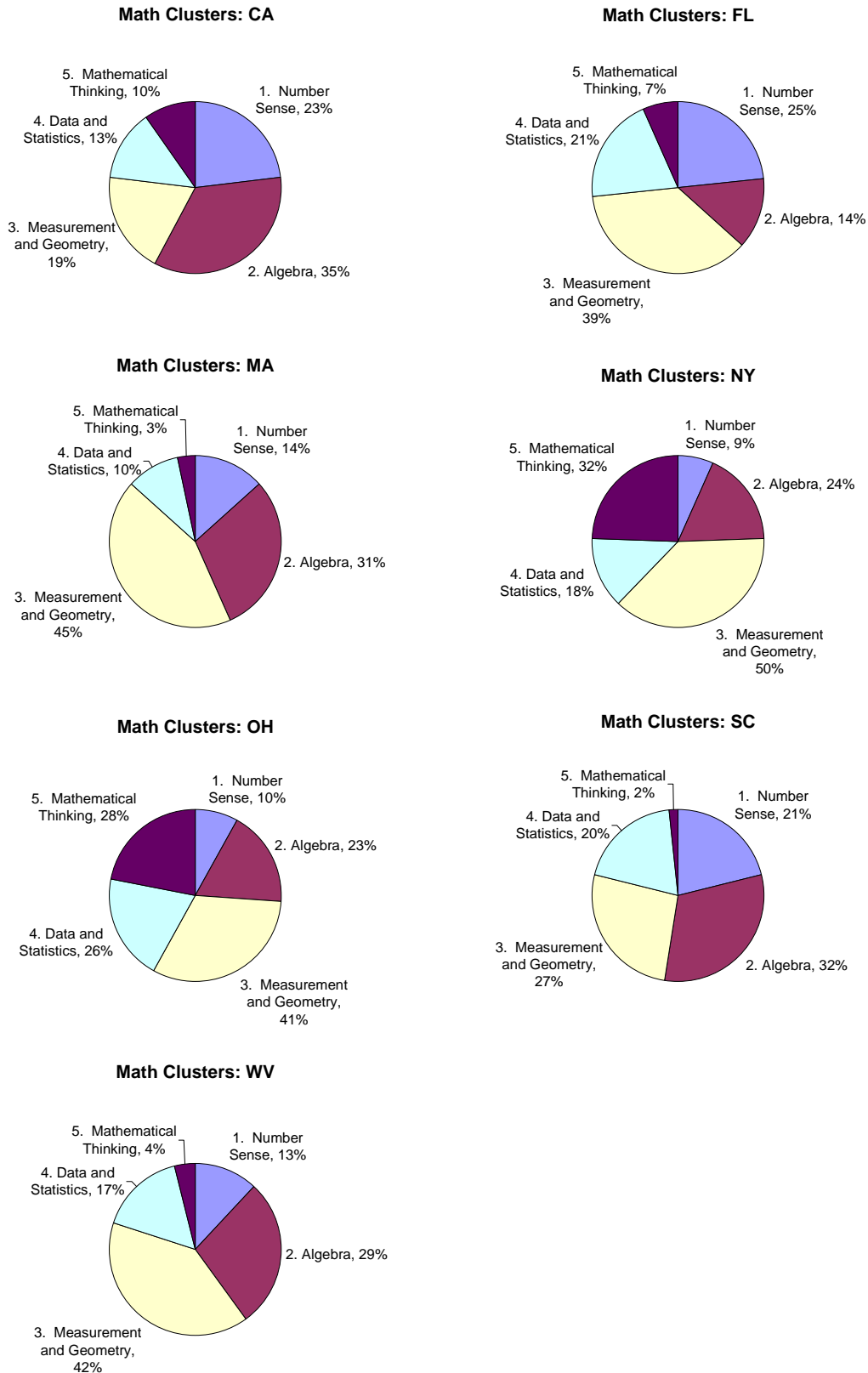


Figure 3.3 Distribution of Math Objectives Among Clusters, by State

Depth of Knowledge Comparisons

The DOK ratings provide a key basis for comparing state objectives within each of the key content clusters. The comparisons are only valid to the extent that judges can provide reliable DOK ratings. To examine the reliability of these ratings, we took advantage of the fact that each of the California content standards was included in both of the card decks. This meant that the same standards were rated by two different set of raters. Examining differences in ratings across the two decks also accounted for possible context effects, due the differences in the other states included in the deck.

In addition to the average DOK ratings from each deck, we also looked at DOK ratings collected in our June 2005 item review workshops. The first step in the Webb alignment process used in those workshops was to develop consensus ratings of the DOK required by each content standard. The workshops provided two independent replications of this process, one at the northern California workshop and the other at the southern California workshop.

Table 3.9 shows the means, standard deviations, and correlations of the independent DOK ratings across California's CAHSEE mathematics content standards. There was a mean difference of about 0.8 on the 4-point DOK scale between the two types of workshops. The standard deviations were similar across all four sources. The correlation between the Deck A and Deck B ratings provides an estimate of internal consistency. The observed value of .87 suggests high reliability for these ratings, considerably higher than the .59 correlation between the ratings from the two item review workshops². Notwithstanding a significant difference in mean ratings, the correlation of the DOK ratings across the two workshops was quite high. The correlation between the averages from each workshop (not shown in the table) was .78.

Table 3.10 shows the means, standard deviations, and correlations of the independent DOK ratings across California's CAHSEE ELA content standards. For ELA, there was only a very small mean difference between the means from the two types of workshops, only 0.2 on the 4-point scale. The standard deviations were similar across all four sources. The correlation between the Deck A and Deck B ratings provides an estimate of internal consistency. The observed value of .79 suggests high reliability for these ratings, again slightly higher than the .76 correlation between the ratings from the two item review workshops³. The correlation of the DOK ratings across the two workshops was again high. The correlation between the averages from each workshop

² The item review workshops resulted in a single consensus rating required by the Webb alignment process. This consensus judgment may not have been as reliable as the average across six independent raters used in the content alignment workshop.

³ The item review workshops resulted in a single consensus rating required by the Webb alignment process. This consensus judgment may not have been as reliable as the average across six independent raters used in the content alignment workshop.

(not shown in the table) was .70⁴. There was a difference between the panelists who rated ELA Deck A and those who rated ELA Deck B in the agreement of their DOK ratings with the DOK ratings from the item review workshops. DOK ratings from Deck A correlated about .7 with the average ratings from the item review workshop compared to about .6 for the Deck B ratings.

Table 3.9 Correlation of Depth of Knowledge Ratings for California Math Content Standards

Source of Ratings	Mean	Standard Deviation	Correlation With			
			Deck A	Deck B	North Workshop	South Workshop
Content Comparison Workshop – Deck A	1.7	0.6	1.00	0.87	0.59	0.61
Content Comparison Workshop – Deck B	1.8	0.6	0.87	1.00	0.62	0.68
Content Comparison Workshop - Average	1.8	0.6	0.96	0.97	0.63	0.66
Item Review Workshop – North	2.6	0.5	0.59	0.62	1.00	0.59
Item Review Workshop - South	2.6	0.6	0.61	0.68	0.59	1.00
Item Review Workshop - Average	2.7	0.6	0.68	0.73	0.78	0.84

⁴ The writing application standards were treated at a greater level of detail in the item review workshops. Ratings for these standards were not comparable across the two types of workshops and were excluded from these analyses.

Table 3.10 Correlation of Depth of Knowledge Ratings for California ELA Content Standards

Source of Ratings	Mean	Standard Deviation	Correlation With			
			Deck A	Deck B	North Workshop	South Workshop
Content Comparison Workshop – Deck A	2.6	0.6	1.00	0.79	0.73	0.76
Content Comparison Workshop – Deck B	2.6	0.5	0.79	1.00	0.54	0.67
Content Comparison Workshop - Average	2.6	0.5	0.96	0.93	0.68	0.76
Item Review Workshop – North	2.8	0.6	0.73	0.54	1.00	0.76
Item Review Workshop – South	2.9	0.7	0.76	0.67	0.76	1.00
Item Review Workshop - Average	2.9	0.6	0.71	0.58	0.81	0.96

Tables 3.11 and 3.12 show average DOK and clarity ratings for each content cluster and state. For each content cluster and state, the table shows the number of objectives rated, the average DOK rating and the percent of objectives rated as clear. Two sets of ratings are shown for the California objectives, one from Deck A and the other from Deck B, along with the average of these two. The first three states listed after California were the ones included in Deck A. The last three states listed under each content cluster were the ones included in Deck B. The bottom two rows for each content cluster show the average of the ratings for the other states and the difference between the California average and the average for the other states. Positive numbers indicate that the average rating for California was higher than the average of the corresponding ratings for all of the other states.

Table 3.11 Average DOK by Mathematics Content Cluster and State

Content Cluster	State	No. of Objectives	Average DOK	Percent Clear
1. Number Sense	CA, Deck A	12	1.43	83
	CA, Deck B	12	1.33	92
	CA - Avg.	12	1.38	87.5
	FL	6	1.71	78
	MA	4	1.63	96
	SC	12	1.42	75
	NY	3	1.39	50
	OH	7	1.45	90
	WV	3	1.44	83
	Other-Avg	5.8	1.51	79
	Difference	6.2	-0.13	8.5
2. Algebra	CA, Deck A	18	1.66	89
	CA, Deck B	18	1.81	96
	CA - Avg.	18	1.72	92.5
	FL	4	2.50	88
	MA	9	1.92	83
	SC	18	1.58	76
	NY	8	2.00	53
	OH	9	2.08	96
	WV	7	1.76	83
	Other-Avg	9.2	1.97	80
	Difference	8.8	-0.26	12.5
3. Measurement & Geometry	CA, Deck A	10	1.75	90
	CA, Deck B	10	1.92	98
	CA - Avg.	10	1.84	94
	FL	11	1.98	80
	MA	13	1.63	83
	SC	15	1.37	86
	NY	17	1.89	59
	OH	16	1.98	88
	WV	10	1.69	85
	Other-Avg	13.7	1.76	80
	Difference	-3.7	0.08	14
4. Data and Statistics	CA, Deck A	7	1.67	88
	CA, Deck B	7	1.93	93
	CA - Avg.	7	1.80	90.5
	FL	6	2.36	86
	MA	3	2.33	94
	SC	10	1.48	93
	NY	6	1.94	74
	OH	10	2.64	97
	WV	4	2.33	83
	Other-Avg	6.5	2.18	88
	Difference	0.5	-0.38	2.5

Content Cluster	State	No. of Objectives	Average DOK	Percent Clear
5. Mathematical Thinking	CA, Deck A	5	2.80	77
	CA, Deck B	5	2.93	59
	CA - Avg.	5	2.87	68
	FL	2	2.92	83
	MA	1	3.17	83
	SC	1	2.83	67
	NY	11	2.40	67
	OH	11	2.76	71
	WV	1	2.33	83
	Other-Avg	4.5	2.74	76
Difference		0.5	0.13	-8

Figure 3.4 shows the average DOK ratings for the mathematics standards from each content cluster and state. The California averages are about the same as DOK ratings for other states. California is at the low end of the DOK ratings for Number Sense standards and at the high end among states that had standards in the Mathematical Thinking cluster.

Average DOK by Math Cluster and State

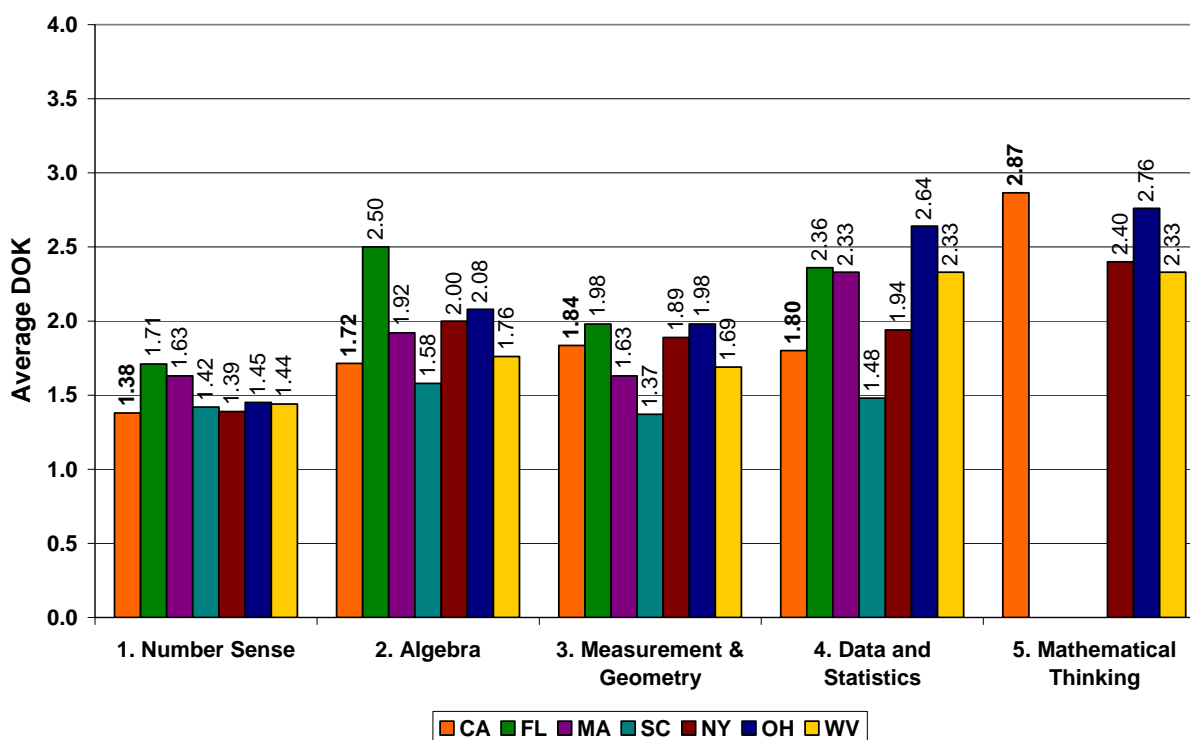


Figure 3.4 Average Depth of Knowledge by Mathematics Content Cluster and State

Table 3.12 Average Depth of Knowledge by ELA Content Cluster and State

Content Cluster	State	No. of Objectives	Average DOK	Percent Clear
1. Reading/Vocabulary	CA, Deck A	2	2.08	100
	CA, Deck B	2	2.25	100
	CA - Avg.	2	2.17	100
	MA	5	1.93	97
	SC	4	2.00	96
	TX	2	2.08	73
	NC	0		
	NY	0		
	WV	5	1.77	79
	Other-Avg	2.7	1.94	86
	Difference	-0.7	0.23	14
2. Reading/Comprehension	CA, Deck A	16	2.66	81
	CA, Deck B	16	2.74	83
	CA - Avg.	16	2.70	82
	MA	14	2.74	62
	SC	12	2.96	69
	TX	8	2.86	60
	NC	10	3.20	42
	NY	18	2.58	62
	WV	8	2.28	73
	Other-Avg	11.7	2.77	61
	Difference	4.3	-0.07	21
3. Writing	CA, Deck A	12	2.75	65
	CA, Deck B	12	2.80	85
	CA - Avg.	12	2.78	75
	MA	16	2.31	79
	SC	7	2.95	71
	TX	9	2.70	65
	NC	4	2.50	53
	NY	13	2.71	60
	WV	18	2.15	82
	Other-Avg	11.2	2.55	68
	Difference	0.8	0.23	7
4. Communication	CA, Deck A	1	3.50	83
	CA, Deck B	1	3.67	80
	CA - Avg.	1	3.59	81.5
	MA	11	2.83	67
	SC	4	2.71	57
	TX	2	3.00	67
	NC	4	3.17	70
	NY	5	2.03	50
	WV	6	1.78	81
	Other-Avg	5.3	2.59	65
	Difference	-4.3	1.00	16.5

Figure 3.5 shows the average DOK ratings for the ELA standards from each content cluster and state. The California averages are about the same as DOK ratings for other states. California is at the high end of the DOK ratings for Word Skills and Communications standards and in the middle of the range for the Reading and Writing standards.

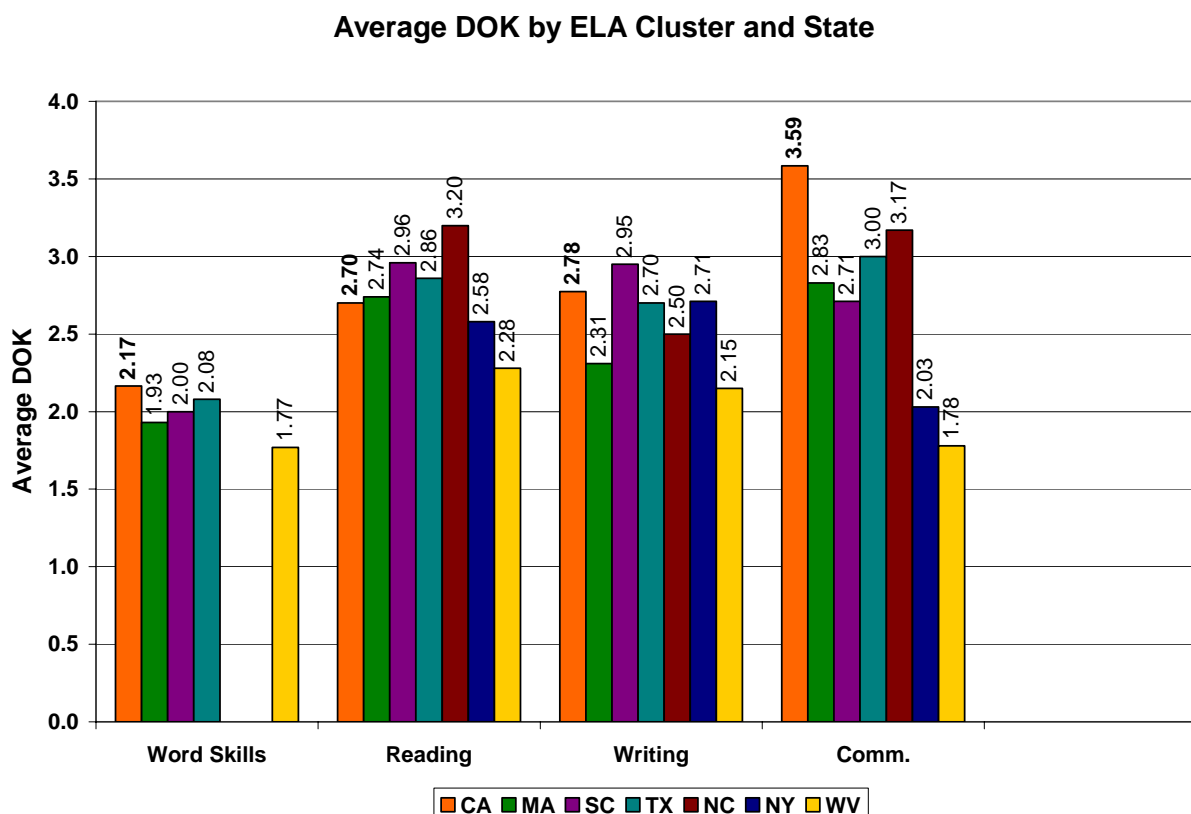


Figure 3.5 Average Depth of Knowledge of ELA Standards by State and Content Cluster

Clarity Ratings

Tables 3.11 and 3.12 above also show the percent of objectives rated as clear for each state and content cluster. As described in the methods section above, panelists were asked to rate the clarity of the DOK requirements for each objective. Figures 3.6 and 3.7 show the average clarity ratings by state and content cluster graphically.

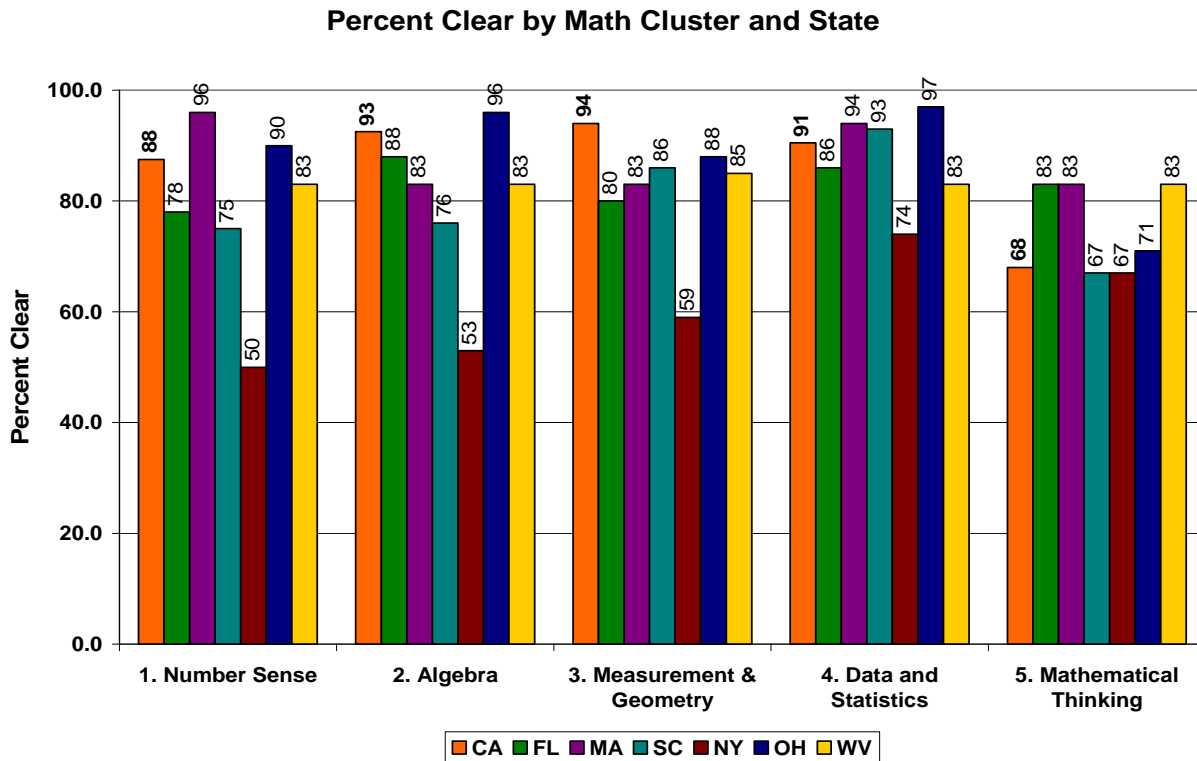


Figure 3.6 Percent of Math Objectives Rated Clear by Content Cluster and State

Recall that the panelists making the clarity ratings did not teach in any of the states included in the study. The generally high clarity ratings provides support for the validity of the DOK ratings reported above and is consistent with the high reliability estimated for the mean ratings. As shown in Figure 3.6, the clarity of DOK requirements was quite high for California's mathematics standards. The one exception was in the area of mathematical thinking, which was a difficult area for many states. Results displayed in Figure 3.7 indicate that California's ELA content standards also had high clarity ratings relative to the other states in this study.

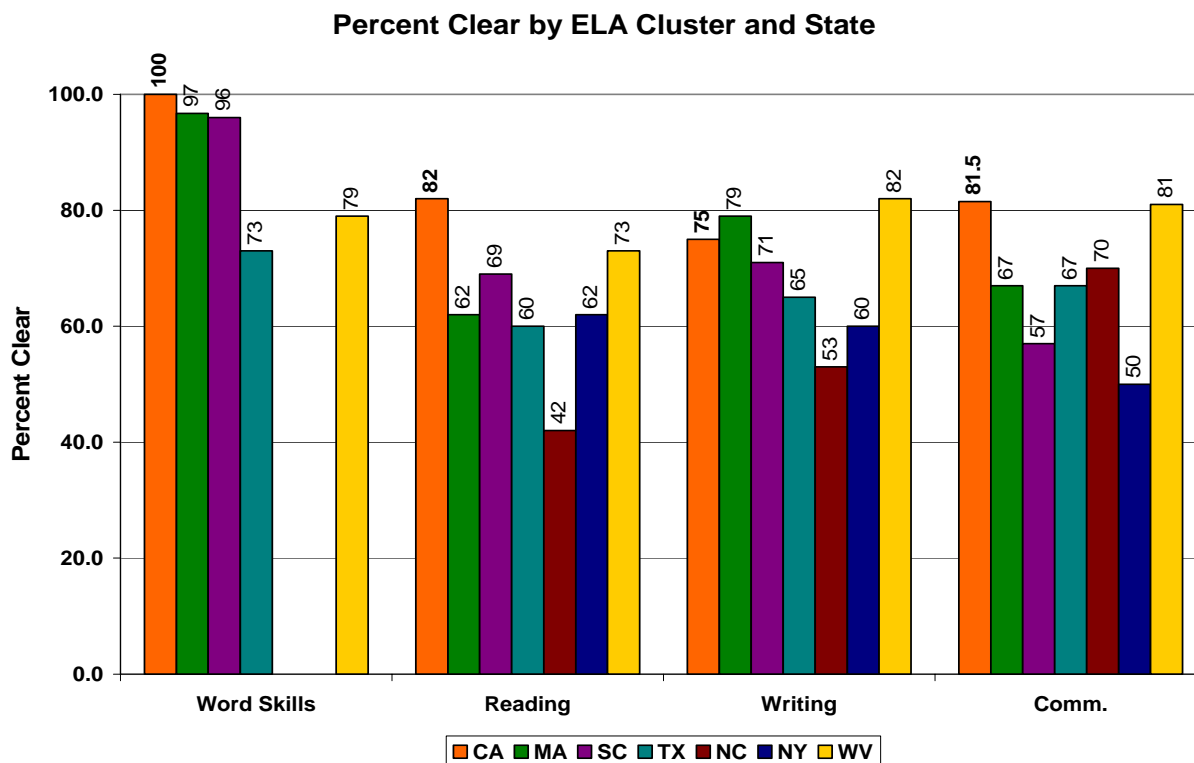


Figure 3.7 Percent of ELA Objectives Rated Clear by Content Cluster and State

Summary

HumRRO conducted a high school content comparison study that involved reviewing content standards for assessments used with high school accountability systems in other states, selecting a set of states with standards judged to be exemplary, and recruiting experts from a neutral state to compare the range and depth of the CAHSEE content standards and the high school accountability standards used in the other states.

Common clusters of content standards were identified based on feedback from the experts. There were some differences among the states in the specific areas of content they chose to include in high school accountability assessments. There was also a great deal of similarity in the content covered. The range of content covered by the CAHSEE ELA and mathematics tests was every bit as broad as the range of content covered by the other states in this study. The DOK required of California students according to the content standards was also quite comparable to the DOK required in other states. Available evidence indicated a high degree of consistency in the DOK ratings.

The panelists were also asked to rate the clarity of the DOK requirements for the ELA and mathematics tests. Clarity ratings for the California content standards were at the high end of the distribution compared to the other states in the study.

Chapter 4: Review of California's High School End-of-Course Mathematics Tests

Some states are using end-of-course tests in their high school accountability systems. In this chapter, we report results of a review of California's end-of-course tests in mathematics to assess the feasibility and appropriateness of making use of these tests for high school accountability.

California has developed and adopted mathematics grade-level content standards for grades kindergarten through 7 and course-level content standards for mathematics courses students may take in grades 8 through 12. In addition, California administers a General Mathematics assessment to 8th and 9th grade students who have not yet taken Algebra I. The only specific mathematics course that students are required to take for high school graduation is Algebra I. Along with the content standards, mathematics end-of-grade assessments have been developed for grades 2 through 7 and end-of-course assessments have been developed for mathematics courses taken after the 7th grade. Test blueprints, showing the content standards covered by each of these assessments may be found at <http://www.cde.ca.gov/ta/tg/sr/blueprints.asp>.

Table 4.1 shows the number and percent of students in grades 8 through 11 taking each of the California Standards Test (CST) mathematics assessments in 2005. Note that 20% of the 10th graders and nearly 25% of the 11th graders do not take any end-of-course mathematics test, in most cases because they are not taking any mathematics courses. About 25% of the 9th graders take the General Math test. A plurality of the 9th graders (46%) take the Algebra I test.

A significant difficulty in using end-of-course tests for state-wide accountability is the significant independent control that districts exert over their own curricula. As shown in Table 4.1, students are taking different courses and different end-of-course assessments at different times. There is not one course taken by a majority of the students at any given grade. In addition, some districts have implemented an integrated mathematics curriculum that sequences the topics covered differently from the more traditional mathematics curriculum.

Table 4.1 Number of Grade 8-11 Students Taking CST Mathematics Tests in 2005

Course		Grade			
		8	9	10	11
2005 Enrollment		498,903	535,182	481,983	434,411
General Mathematics	Number	240,807	131,359	182	165
	Percent	48.3%	24.5%	0.0%	0.0%
Algebra I	Number	223,577	248,249	136,156	72,720
	Percent	44.8%	46.4%	28.2%	16.7%
Geometry	Number	13,689	101,856	140,737	76,866
	Percent	2.7%	19.0%	29.2%	17.7%
Algebra II	Number	490	15399	85175	94902
	Percent	0.1%	2.9%	17.7%	21.8%
Integrated Math 1	Number	332	3,020	2,337	3,037
	Percent	0.1%	0.6%	0.5%	0.7%
Integrated Math 2	Number	149	1,527	3,249	1,778
	Percent	0.0%	0.3%	0.7%	0.4%
Integrated Math 3	Number	12	177	1,364	2,006
	Percent	0.0%	0.0%	0.3%	0.5%
Summative HS Math	Number		615	12,754	77,480
	Percent	0.0%	0.1%	2.6%	17.8%
Total All Tests	Number	479,056	502,202	381,954	328,954
	Percent	96.0%	93.8%	79.2%	75.7%
Not Tested	Percent	4.0%	6.2%	20.8%	24.3%

HumRRO staff compared the test blueprints for each of the end-of-course tests to the CAHSEE mathematics test blueprint. The CAHSEE covers nearly all of the content standards covered by the General Math test and 10 of the 25 standards covered by the CST Algebra I assessment. Table 4.2 shows differences in coverage between the CST General Math test and the CAHSEE mathematics test. The emphasis given to the 42 content standards covered by both CAHSEE and CST General Math, in terms of the number of items targeted for each standard, is similar but not identical. The CAHSEE has slightly fewer items for some standards in order to make room for Algebra I items that are not included in the General Math test.

Table 4.2 Content Differences between the CAHSEE Mathematics and CST General Math Assessments

Standards Covered by the General Math Assessment, but not the CAHSEE	Standards Covered by the CAHSEE, but not the General Math Assessment
<i>Number Sense</i> 1.5 Know that every rational number is either a terminating or repeating decimal and be able to convert terminating decimals into reduced fractions.	<i>Measurement and Geometry</i> 3.4 Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of two figures.
<i>Algebra and Functions</i> 1.3 Simplify numerical expressions by applying properties of rational numbers (e.g., identity, inverse, distributive, associative, commutative) and justify the process used.	
<i>Statistics, Data Analysis, and Probability</i> 1.3 Understand the meaning of, and be able to compute the minimum, the lower quartile, the median, the upper quartile, and the maximum of a data set.	<i>Algebra I</i> 10 standards from the Algebra I end-of-course assessment are covered by the CAHSEE mathematics test
<i>Mathematical Reasoning</i> 3.1 Evaluate the reasonableness of the solution in the context of the original situation.	
<i>42 standards from Number Sense; Algebra and Functions; Measurement and Geometry; Statistics Data Analysis, and Probability; and Mathematical Reasoning are covered by both assessments.</i>	

Figure 4.1 depicts the overlap between the CAHSEE and the two end-of-course tests, General Math and Algebra. The CAHSEE includes most of the General Math content standards and about a third of the Algebra 1 standards,

	CST General Math	CST Algebra I	Content Standards Covered Only by the CAHSEE	Total Standards in Blueprint
CAHSEE Mathematics	42	10	1	53
Content Standards Not Covered by CAHSEE	3	19		
Total Standards in Blueprints	45	29		

Figure 4.1 Overlap of CAHSEE Mathematics and CST General Math and Algebra I Content Standards

In summary, the CAHSEE covers content from both the General Math and Algebra I assessments. Unlike the end-of-course tests, it is administered to all students during the 10th grade, a time when nearly all students have taken the required Algebra I course.

The CAHSEE content standards are covered in courses through Algebra I that all students are required to take. It is reasonable to hold high schools accountable for student mastery of this material. It does not seem reasonable to include topics from elective courses in a high school accountability measure. This would amount to holding high schools accountable for student mastery of topics they are not required to take.

Chapter 5: Findings and Conclusions

Summary of Findings

The key findings from our review of the use of the CAHSEE for high school accountability are described here.

Finding 1. The content standards for the CAHSEE reflect broad input on what high school students should know and be able to do. Recommendations from the HSEE Panel and the CDE were considered by the SBE, the body with formal responsibility for implementing California's educational policy, in making final decisions on CAHSEE content.

California used a well-specified process to determine the content standards covered by the CAHSEE. This process included selecting a broadly representative panel, public meetings of this panel to receive broad input on factors that might affect their considerations, and review and approval of their recommendations by the SBE.

Initially, 9th graders were allowed to take the CAHSEE on a voluntary basis. Subsequently, it was decided that students should not be allowed to take the CAHSEE until they had completed at least a year and a half of high school. Even at this point, more than a third of California's high school students have not yet mastered the required content. Clearly, high schools have a major responsibility both for preparing students to take the CAHSEE in the 10th grade and for subsequent efforts to ensure that all students can pass the CAHSEE.

Finding 2. The range of content covered and depth of knowledge required by the CAHSEE are similar to the range and depth of high school accountability measures in other states.

The range of the CAHSEE content standards is similar to the range of standards covered in other states' high school standards whose content standards have been reviewed positively.

Finding 3. The content covered by the CAHSEE is broader than the content covered by either California's General Math or end-of-course Algebra I assessments, but not as extensive as the content covered by end-of-course assessments for subsequent, elective mathematics courses (Geometry, Algebra II, and Advanced Mathematics).

The mathematics end-of-course assessments do not provide a viable alternative for high school accountability. Content standards for Algebra I, the only course all students are required to take, are narrow and do not include the full range of mathematical knowledge and skill judged important for graduation. Further, it would not

be possible to include end-of-course tests for elective courses in high school accountability measures and still meet NCLB inclusion requirements.

Based on these findings, we conclude that the CAHSEE provides an appropriate measure for high school accountability. Students are not allowed to take the CAHSEE until 10th grade because many or most need courses provided by high schools during the 9th and 10th grade to be fully prepared to pass the test. In addition, high schools have a significant responsibility for ensuring that students who do not initially pass—roughly one-third of all students—reach the required level of achievement by the end of their senior year. It is difficult to see how a high school accountability system could go beyond the content required of all students. Further, the SBE set a higher target for the level of proficiency students would be required to meet for high school accountability than was set previously for the graduation requirement. Meeting the graduation requirement was considered to signify basic mastery of the required content. Higher levels were set for demonstrating proficient and advanced performance for purposes of high school-level accountability.

Future Enhancements to the CAHSEE Content Standards

Achieve and other organizations are calling for much higher standards for high school graduation for all states, particularly in mathematics. If additional mathematics courses were required of all students, it would then be reasonable to hold high schools accountable for student mastery of the material covered in these additional courses.

The SBE has signaled its intention for further increases in the graduation requirements in the future. The current requirements, however, continue to pose a significant challenge to schools and students. It would seem prudent to focus first on getting essentially all students up to the current standards before making further changes. College admissions provide additional requirements for students, beyond high school diploma requirements, that motivate them to continue past the current diploma requirements.

When the SBE is ready to modify content requirements for the CAHSEE, the comparisons to other states reported here should provide insights about content areas to consider. In ELA, for example, many states include more extensive standards in the area of communication, such as presentation skills, than are covered in the current CAHSEE ELA standards. In mathematics, communicating mathematics concepts is an example of a topic covered more extensively in some other states.

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Appendix A: ELA and Math Clusters

The following tables detail the standards and objectives that were grouped into clusters and subclusters, across states. The first four tables define the four ELA clusters. These are followed by tables describing the five Math Clusters.

ELA Clusters**Table A.1. ELA Cluster 1: Word Skills.**

CLUSTER 1. WORD SKILLS				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 1.1 VOCABULARY				
CA	9.1	Students apply their knowledge of word origins to determine the meaning of new words encountered in reading materials and use those words accurately.	9.1.1	Vocabulary and Concept Development: identify and use the literal and figurative meanings of words and understand word derivations
			9.1.2	Vocabulary and Concept Development: distinguish between the denotative and connotative meanings of words and interpret the connotative power of words
MA	1.4	Students will understand and acquire new vocabulary and use it correctly in reading and writing.	1.4.1	Identify and use correctly idioms, cognates, words with literal and figurative meanings, and patterns of word changes that indicate different meanings or functions.
			1.4.2	Use knowledge of Greek, Latin, and Norse mythology, the Bible, and other works often alluded to in British and American literature to understand the meanings of new words.
	1.5	Students will analyze standard English grammar and usage and recognize how its vocabulary has developed and been influenced by other languages.	1.5.7	Describe the origins and meanings of common words and foreign words or phrases used frequently in written English, and show their relationship to historical events or developments (glasnost, coup d'état).
	1.6	Students will describe, analyze, and use appropriately formal and informal English.	1.6.1	Identify content-specific vocabulary, terminology, or jargon unique to particular social or professional groups
SC		Word Study and Analysis: The student will apply a knowledge of word analysis strategies to determine the meaning of new words encountered in reading material and use them correctly.		Analyze analogies, idioms, and words with precise connotations and denotations.
		Word Study and Analysis: The student will apply a knowledge of word analysis strategies to determine the meaning of new words encountered in reading material and use them correctly.		Use context analysis to determine the meanings of unfamiliar or multiple-meaning words.
		Word Study and Analysis: The student will apply a knowledge of word analysis strategies to determine the meaning of new words encountered in reading material and use them correctly.		Use knowledge of roots and affixes to analyze the meaning of complex words.

CLUSTER 1. WORD SKILLS

State	Standard ID	Standard Description	Objective ID	Objective Description
TX	1	The student will demonstrate a basic understanding of culturally diverse written texts.	1.1	The student acquires an extensive vocabulary through reading and systematic word study. The student is expected to rely on context to determine meanings of words and phrases such as figurative language, [idioms,] multiple-meaning words, and technical vocabulary; apply meanings of prefixes, roots, and suffixes in order to comprehend; and use reference material such as glossary, dictionary, [thesaurus, and available technology] to determine precise meanings and usage.
	3	The student will demonstrate the ability to analyze and critically evaluate culturally diverse written texts and visual representations.	3.1	The student acquires an extensive vocabulary through reading and systematic word study. The student is expected to discriminate between connotative and denotative meanings and interpret the connotative power of words; and read and understand analogies.
WV	1	Students will use skills to read for literacy experiences, read to inform and read to perform a task by: identifying and using the dimensions of reading (phonemic awareness, phonics, background knowledge/vocabulary, high frequency words/fluency, comprehension, writing and motivation to read); and employing a wide variety of literature in developing independent readers.	1.1	Expand vocabulary through reading classic literature.
			1.11	Apply knowledge of word etymologies to determine meaning of words.
			1.12	Explain word etymologies to determine word meaning.
			1.5	Continue to use context clues to establish word meaning (e.g., including words with multiple meanings).
	2	Students will employ a wide range of writing strategies to communicate effectively for different purposes by: developing the writing process; applying grammatical and mechanical properties in writing; and gathering and using information for research purposes.	2.15	Compare and contrast pronunciation of words and different spelling (e.g., dictionary; spell check; thesaurus).

SUBCLUSTER 1.2 WORD REFERENCE

MA	1.4	Students will understand and acquire new vocabulary and use it correctly in reading and writing.	1.4.3	Use general dictionaries, specialized dictionaries, thesauruses, or related references as needed to increase learning.
SC		Word Study and Analysis: The student will apply a knowledge of word analysis strategies to determine the meaning of new words encountered in reading material and use them correctly.		Use a general dictionary, a specialized dictionary, and a thesaurus.

Table A.2. ELA Cluster 2: Reading Comprehension.

CLUSTER 2. READING COMPREHENSION				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 2.1 COMPREHENSION				
CA	9.2	Students read and understand grade-level-appropriate material. They analyze the organizational patterns, arguments, and positions advanced. The selections in Recommended Literature, Grades Nine Through Twelve (1990) illustrate the quality and complexity of the materials to be read by students. In addition, by grade twelve, students read two million words annually on their own, including a wide variety of classic and contemporary literature, magazines, newspapers, and online information. In grades nine and ten, students make substantial progress toward this goal.	8.2.1	Structural Features of Informational Materials: compare and contrast the features and elements of consumer materials to gain meaning from documents (e.g., warranties, contracts, product information, instruction manuals).
			9.2.1	Structural Features of Informational Materials: analyze the structure and format of functional workplace documents, including the graphics and headers and explain how authors use the features to achieve their purposes
			9.2.4	Comprehension and Analysis of Grade-Level-Appropriate Text: synthesize the content from several sources or works by a single author dealing with a single issue; paraphrase the ideas and connect them to other sources and related topics to demonstrate comprehension
MA	2.1	Students will identify the basic facts and main ideas in a text and use them as the basis for interpretation.	2.1.3	For informational/expository texts: Analyze the logic and use of evidence in an author's argument.
	2.6	Students will identify, analyze, and apply knowledge of the purpose, structure, and elements of nonfiction or informational materials and provide evidence from the text to support their understanding.	2.6.1	Analyze the logic and use of evidence in an author's argument
	2.8	Students will identify and analyze how an author's words appeal to the senses, create imagery, suggest mood, and set tone and provide evidence from the text to support their understanding.	2.8.1	Evaluate how an author's choice of words advances the theme or purpose of a work.
NY	1.1	LISTENING & READING to acquire information and understanding involves collecting data, facts, and ideas; discovering relationships, concepts, and generalizations; and using knowledge from oral, written, and electronic sources.	1.1.1	Interpret and analyze complex informational texts and presentations, including technical manuals, professional journals, newspaper and broadcast editorials, electronic networks, political speeches and debates, and primary source material in their subject area courses
			1.1.2	Synthesize information from diverse sources and identify complexities and discrepancies in the information

CLUSTER 2. READING COMPREHENSION

State	Standard ID	Standard Description	Objective ID	Objective Description
			1.1.3	Use a combination of techniques (e.g., previewing, use of advance organizers, structural cues) to extract salient information from texts
			1.1.4	Make distinctions about the relative value and significance of specific data, facts, and ideas
			1.1.5	Make perceptive and well developed connections to prior knowledge
			1.1.6	Evaluate writing strategies and presentational features that affect interpretation of the information.
	3.1	LISTENING & READING to analyze and evaluate experiences, ideas, information, and issues requires using evaluative criteria from a variety of perspectives and recognizing the difference in evaluations based on different sets of criteria.	3.1.1	Analyze, interpret, and evaluate ideas, information, organization, and language of a wide range of general and technical texts and presentations across subject areas, including technical manuals, professional journals, political speeches, and literary criticism
SC		Reading Process and Comprehension: The student will integrate various cues and strategies to comprehend what he or she reads.		Make connections within and between texts. In responding to test questions, the student may be asked to: compare and contrast information; determine author's purpose; and analyze characteristics of genres/elements of poetry.
				Follow multi-step directions such as those for preparing applications and completing forms.
				Evaluate text for clarity and accuracy. In responding to test questions, the student may be asked to determine undocumented statements/inadequate support; and analyze author's use of bias and propaganda techniques.
				Analyze the relationships among thesis, evidence, and argument in informational texts. In responding to test questions, the student may be asked to determine the main idea (thesis); determine details that support the thesis; and analyze arguments for undocumented statements/inadequate support for opinions.
				Draw conclusions and make inferences. In responding to test questions, the student may be asked to draw conclusions and make inferences; make predictions about texts; and compare and contrast findings from two or more texts.
				Paraphrase and synthesize ideas of several authors on one topic. In responding to test questions, the student may be asked to summarize, paraphrase, analyze and evaluate texts; and compare and contrast findings from two or more texts. Follow multi-step directions such as those for preparing applications and completing forms.
TX	1	The student will demonstrate a basic understanding of culturally diverse written texts.	1.2	The student comprehends selections using a variety of strategies. The student is expected to produce summaries of texts by identifying

CLUSTER 2. READING COMPREHENSION

State	Standard ID	Standard Description	Objective ID	Objective Description
				main ideas and their supporting details.
WV	1	Students will use skills to read for literacy experiences, read to inform and read to perform a task by: identifying and using the dimensions of reading (phonemic awareness, phonics, background knowledge/vocabulary, high frequency words/fluency, comprehension, writing and motivation to read); and employing a wide variety of literature in developing independent readers.	1.4	Employ reading strategies necessary for various reading purposes (e.g., literary experience; information; and task performance).
			1.6	Recognize characteristics of author's style, purpose and tone.
			1.7	Form supportable predictions, opinions, inferences and conclusions based upon a text and/or implicit ideas.
			1.9	Recognize persuasive language and techniques (e.g., advertisements; junk mail; news stories).

SUBCLUSTER 2.2 LITERATURE

CA	9.3	Students read and respond to historically or culturally significant works of literature that reflect and enhance their studies of history and social science. They conduct in-depth analyses of recurrent patterns and themes. The selections in Recommended Literature, Grades Nine Through Twelve illustrate the quality and complexity of the materials to be read by students.	8.3.7	Literary Criticism: analyze a work of literature, showing how it reflects the heritage, traditions, attitudes, and beliefs of its author. (Biographical approach)
			9.3.1	Structural Features of Literature: articulate the relationship between the expressed purposes and the characteristics of different forms of dramatic literature (e.g., comedy, tragedy, drama, dramatic monologue)
			9.3.3	Narrative Analysis of Grade-Level-Appropriate Text: analyze interactions between main and subordinate characters in a literary text (e.g., internal and external conflicts, motivations, relationships, influences) and explain the way those interactions affect the plot
			9.3.5	Narrative Analysis of Grade-Level-Appropriate Text: compare works that express a universal theme, and provide evidence to support the ideas expressed in each work
MA	2.2	Students will deepen their understanding of a literary or non-literary work by relating it to its contemporary context or historical background.	2.2.1	Relate a literary work to primary source documents of its literary period or historical setting.
	2.3	Students will identify, analyze, and apply knowledge of the characteristics of different genres.	2.3.1	Compare and contrast the presentation of a theme or topic across genres to explain how the selection of genre shapes the message.
	2.9	Students will identify, analyze, and apply knowledge of the	2.9.1	Analyze the characters, structure, and themes of classical Greek

CLUSTER 2. READING COMPREHENSION

State	Standard ID	Standard Description	Objective ID	Objective Description
		themes, structure, and elements of myths, traditional narratives, and classical literature and provide evidence from the text to support their understanding.		drama and epic poetry.
NC	5	The learner will demonstrate understanding of various literary genres, concepts, elements, and terms.	5.1	Read and analyze various literary works by: using effective reading strategies for preparation, engagement, reflection; recognizing and analyzing the characteristics of literary genres, including fiction (e.g., myths, legends, short stories, novels), nonfiction (e.g., essays, biographies, autobiographies, historical documents), poetry (e.g., epics, sonnets, lyric poetry, ballads) and drama (e.g., tragedy, comedy); interpreting literary devices such as allusion, symbolism, figurative language, flashback, dramatic irony, dialogue, diction, and imagery; understanding the importance of tone, mood, diction, and style; explaining and interpreting archetypal characters, themes, settings; explaining how point of view is developed and its effect on literary texts; determining a character's traits from his/her actions, speech, appearance, or what others say about him or her; explaining how the writer creates character, setting, motif, theme, and other elements; making thematic connections among literary texts and media and contemporary issues; understanding the importance of cultural and historical impact on literary texts; producing creative responses that follow the conventions of a specific genre and using appropriate literary devices for that genre.
NY	2.1	LISTENING & READING for literary response involves comprehending, interpreting, and critiquing imaginative texts in every medium, drawing on personal experiences and knowledge to understand the text, and recognizing the social, historical and cultural features of the text.	2.1.1	Read and view independently and fluently across many genres of literature from many cultures and historical periods
			2.1.2	Identify the distinguishing features of different literary genres, periods, and traditions and use those features to interpret the work
			2.1.5	Read aloud expressively to convey a clear interpretation of the work
			2.1.6	Evaluate literary merit based on an understanding of the genre, the literary elements, and the literary period and tradition
TX	1	The student will demonstrate a basic understanding of culturally diverse written texts.	1.3	The student reads extensively and intensively for different purpose sin varied sources, including world literature. The student is expected to read in varied sources such as diaries, journals, textbooks, maps, newspapers, letters, speeches, memoranda, [electronic texts, and other media].

CLUSTER 2. READING COMPREHENSION

State	Standard ID	Standard Description	Objective ID	Objective Description
	2	The student will demonstrate an understanding of the effects of literary elements and techniques in culturally diverse written texts.	2.1	The student expresses and supports responses to various types of texts. The student is expected to use elements of text to defend his/her own responses and interpretations.
	3	The student will demonstrate the ability to analyze and critically evaluate culturally diverse written texts and visual representations.	3.3	The student reads extensively and intensively for different purposes in varied sources, including world literature. The student is expected to interpret the possible influences of the historical context on a literary work.
WV	1	Students will use skills to read for literacy experiences, read to inform and read to perform a task by: identifying and using the dimensions of reading (phonemic awareness, phonics, background knowledge/vocabulary, high frequency words/fluency, comprehension, writing and motivation to read); and employing a wide variety of literature in developing independent readers.	1.1	Analyze and research historical, cultural and biographical influences of literary works.
			1.2	Compare and contrast literary styles according to genre.
			1.3	Increase the amount of independent reading with emphasis on American, British and World literature.
SUBCLUSTER 2.3 ANALYSIS AND CRITICISM				
CA	9.2	Students read and understand grade-level-appropriate material. They analyze the organizational patterns, arguments, and positions advanced. The selections in Recommended Literature, Grades Nine Through Twelve (1990) illustrate the quality and complexity of the materials to be read by students. In addition, by grade twelve, students read two million words annually on their own, including a wide variety of classic and contemporary literature, magazines, newspapers, and online information. In grades nine and ten, students make substantial progress toward this goal.	9.2.5	Comprehension and Analysis of Grade-Level-Appropriate Text: extend ideas presented in primary or secondary sources through original analysis, evaluation, and elaboration
			9.2.7	Expository Critique: critique the logic of functional documents by examining the sequence of information and procedures in anticipation of possible reader misunderstandings
			9.2.8	Expository Critique: evaluate the credibility of an author's argument or defense of a claim by critiquing the relationship between generalizations and evidence, the comprehensiveness of evidence, and the way in which the author's intent affects the structure and tone of the text (e.g., in professional journals, editorials, political speeches, primary source material)
MA	2.1	Students will identify the basic facts and main ideas in a text	2.1.1	For imaginative/literary texts: Identify and analyze patterns of

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State	Standard ID	Standard Description	Objective ID	Objective Description
		and use them as the basis for interpretation.		imagery or symbolism.
			2.1.2	For imaginative/literary texts: Identify and interpret themes and give supporting evidence from a text.
	2.4	Students will identify, analyze, and apply knowledge of theme in a literary work and provide evidence from the text to support their understanding.	2.4.1	Apply knowledge of the concept that the theme or meaning of a selection represents a view or comment on life, and provide support from the text for the identified themes.
	2.5	Students will identify, analyze, and apply knowledge of the structure and elements of fiction and provide evidence from the text to support their understanding.	2.5.1	Locate and analyze such elements in fiction as point of view, foreshadowing, and irony.
	2.8	Students will identify and analyze how an author's words appeal to the senses, create imagery, suggest mood, and set tone and provide evidence from the text to support their understanding.	2.8.2	Identify and describe the importance of sentence variety in the overall effectiveness of an imaginary/literary or informational/expository work.
NC	1	The learner will express reflections and reactions to print and non-print text and personal experiences.	1.3	Demonstrate the ability to read, listen to and view a variety of increasingly complex print and non-print expressive texts appropriate to grade level and course literary focus, by: selecting, monitoring, and modifying as necessary reading strategies appropriate to readers' purpose; identifying and analyzing text components (such as organizational structures, story elements, organizational features) and evaluating their impact on the text; providing textual evidence to support understanding of and reader's response to text; demonstrating comprehension of main idea and supporting details; summarizing key events and/or points from text; making inferences, predicting, and drawing conclusions based on text; identifying and analyzing personal, social, historical or cultural influences, contexts, or biases; making connections between works, self and related topics; analyzing and evaluating the effects of author's craft and style; analyzing and evaluating the connections or relationships between and among ideas, concepts, characters and/or experiences; identifying and analyzing elements of expressive environment found in text in light of purpose, audience, and context.
	2	The learner will explain meaning, describe processes, and answer research questions to inform an audience.	2.1	Demonstrate the ability to read, listen to and view a variety of increasingly complex print and non-print informational texts appropriate to grade level and course literary focus, by: selecting, monitoring, and modifying as necessary reading strategies appropriate to readers' purpose; identifying and analyzing text components (such as organizational structures, story elements, organizational features) and evaluating their impact on the text; providing textual evidence to support understanding of and reader's

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State	Standard ID	Standard Description	Objective ID	Objective Description
				response to text; demonstrating comprehension of main idea and supporting details; summarizing key events and/or points from text; making inferences, predicting, and drawing conclusions based on text; identifying and analyzing personal, social, historical or cultural influences, contexts, or biases; making connections between works, self and related topics; analyzing and evaluating the effects of author's craft and style; analyzing and evaluating the connections or relationships between and among ideas, concepts, characters and/or experiences; identifying and analyzing elements of informational environment found in text in light of purpose, audience, and context.
	3	The learner will examine argumentation and develop informed opinions.	3.1	Study argument by: examining relevant reasons and evidence; noting the progression of ideas that substantiate the proposal; analyzing style, tone, and use of language for a particular effect; identifying and analyzing personal, social, historical, or cultural influences contexts, or biases; identifying and analyzing rhetorical strategies that support proposals.
			3.2	Express an informed opinion that: states clearly a personal view; is logical and coherent; engages the reader's interest or curiosity.
			3.3	Support that informed opinion by: providing relevant and convincing reasons; using various types of evidence, such as experience or facts; using appropriate and effective language, reasons, and organizational structure for the audience and purpose; demonstrating awareness of the possible questions, concerns, or counterarguments of the audience.
			3.4	Demonstrate the ability to read, listen to and view a variety of increasingly complex print and non-print argumentative texts appropriate to grade level and course literary focus, by: selecting, monitoring, and modifying as necessary reading strategies appropriate to readers' purpose; identifying and analyzing text components (such as organizational structures, story elements, organizational features) and evaluating their impact on the text; providing textual evidence to support understanding of and reader's response to text; demonstrating comprehension of main idea and supporting details; summarizing key events and/or points from text; making inferences, predicting, and drawing conclusions based on text; identifying and analyzing personal, social, historical or cultural influences, contexts, or biases; making connections between works, self and related topics; analyzing and evaluating the effects of author's craft and style; analyzing and evaluating the connections or

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State	Standard ID	Standard Description	Objective ID	Objective Description
				relationships between and among ideas, concepts, characters and/or experiences; identifying and analyzing elements of argumentative environment found in text in light of purpose, audience, and context.
	4	The learner will create and use standards to critique communication.	4.2	Read and critique various genres by: using preparation, engagement, and reflection strategies appropriate for the text; identifying and using standards to evaluate aspects of the work or the work as a whole; judging the impact of different stylistic and literary devices on the work.
			4.3	Demonstrate the ability to read, listen to and view a variety of increasingly complex print and non-print critical texts appropriate to grade level and course literary focus, by: selecting, monitoring, and modifying as necessary reading strategies appropriate to readers' purpose; identifying and analyzing text components (such as organizational structures, story elements, organizational features) and evaluating their impact on the text; providing textual evidence to support understanding of and reader's response to text; demonstrating comprehension of main idea and supporting details; summarizing key events and/or points from text; making inferences, predicting, and drawing conclusions based on text; identifying and analyzing personal, social, historical or cultural influences, contexts, or biases; making connections between works, self and related topics; analyzing and evaluating the effects of author's craft and style; analyzing and evaluating the connections or relationships between and among ideas, concepts, characters and/or experiences; identifying and analyzing elements of critical environment found in text in light of purpose, audience, and context.
	5	The learner will demonstrate understanding of various literary genres, concepts, elements, and terms.	5.2	Demonstrate the ability to read, listen to and view a variety of increasingly complex print and non-print literacy texts appropriate to grade level and course literary focus, by: selecting, monitoring, and modifying as necessary reading strategies appropriate to readers' purpose; identifying and analyzing text components (such as organizational structures, story elements, organizational features) and evaluating their impact on the text; providing textual evidence to support understanding of and reader's response to text; demonstrating comprehension of main idea and supporting details; summarizing key events and/or points from text; making inferences, predicting, and drawing conclusions based on text; identifying and analyzing personal, social, historical or cultural

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State	Standard ID	Standard Description	Objective ID	Objective Description
				influences, contexts, or biases; making connections between works, self and related topics; analyzing and evaluating the effects of author's craft and style; analyzing and evaluating the connections or relationships between and among ideas, concepts, characters and/or experiences; identifying and analyzing elements of literary environment found in text in light of purpose, audience, and context.
NY	1.2	SPEAKING & WRITING to acquire and transmit information requires asking probing and clarifying questions, interpreting information in one's own words, applying information from one context to another, and presenting the information and interpretation clearly, concisely, and comprehensibly.	1.2.2	Present a controlling idea that conveys an individual perspective and insight into the topic
			1.2.4	Support interpretations and decisions about relative significance of information with explicit statement, evidence, and appropriate argument
	2.1	LISTENING & READING for literary response involves comprehending, interpreting, and critiquing imaginative texts in every medium, drawing on personal experiences and knowledge to understand the text, and recognizing the social, historical and cultural features of the text.	2.1.4	Understand how multiple levels of meaning are conveyed in a text
	3.1	LISTENING & READING to analyze and evaluate experiences, ideas, information, and issues requires using evaluative criteria from a variety of perspectives and recognizing the difference in evaluations based on different sets of criteria.	3.1.2	Evaluate the quality of the texts and presentations from a variety of critical perspectives within the field of study (e.g., using both Poe's elements of a short story and the elements of "naturalist fiction" to evaluate a modern story)
			3.1.3	Make precise determinations about the perspective of a particular writer or speaker by recognizing the relative weight he/she places on particular arguments and criteria (e.g., one critic condemns a biography as too long and rambling; another praises it for its accuracy and never mentions its length)
			3.1.4	Evaluate and compare their own and others' work with regard to different criteria and recognize the change in evaluations when different criteria are considered to be more important
SC		Analysis of Texts: The student will use a knowledge of the purposes, structures, and elements of writing to analyze and interpret text.		Compare and contrast authors' styles on the basis of such elements as word choice and sentence structure (syntax) within and between texts. In responding to test questions, the student may be asked to compare and contrast an author's word choice and syntax within text; and compare and contrast authors' word choices and syntax in two or more texts

CLUSTER 2. READING COMPREHENSION

State	Standard ID	Standard Description	Objective ID	Objective Description
				Analyze influences on plots, characters, settings, and themes in literature. In responding to test questions, the student may be asked to determine impact of cause and effect relationships on plot, character, and theme; analyze author's use of characters (static, dynamic, round, and flat); and determine author's purpose
				Compare and contrast universal literary themes within and between texts.
				Evaluate an author's use of stylistic elements. In responding to test questions, the student may be asked to analyze text for Allusion; Aside; Author's purpose; Dialect; Figurative; language Flashback Foreshadowing Hyperbole Imagery Irony Metaphor (including extended) Mood Personification Simile Soliloquy Symbolism Tone Word choice
				Use a knowledge of internal structures to compare selections from works in a variety of genres. In responding to test questions, the student may be asked to determine impact of conflict on plot and character; analyze structural elements of plot; and compare and contrast conflict in two or more texts.
				Identify and analyze point of view, and analyze how the author's choice of narrator affects a work of fiction. In responding to test questions, the student may be asked to determine the speaker in literary works; and analyze how point of view affects a literary work.
2.4 STRUCTURAL ELEMENTS				
CA	9.3	Students read and respond to historically or culturally significant works of literature that reflect and enhance their studies of history and social science. They conduct in-depth analyses of recurrent patterns and themes. The selections in Recommended Literature, Grades Nine Through Twelve illustrate the quality and complexity of the materials to be read by students.	9.3.10	Narrative Analysis of Grade-Level-Appropriate Text: identify and describe the function of dialogue, scene designs, soliloquies, asides, and character foils in dramatic literature
			9.3.4	Narrative Analysis of Grade-Level-Appropriate Text: determine characters' traits by what the characters say about themselves in narration, dialogue, dramatic monologue, and soliloquy
			9.3.6	Narrative Analysis of Grade-Level-Appropriate Text: analyze and trace an author's development of time and sequence, including the use of complex literary devices (e.g., foreshadowing, flashbacks)
			9.3.7	Narrative Analysis of Grade-Level-Appropriate Text: recognize and understand the significance of various literary devices, including

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State	Standard ID	Standard Description	Objective ID	Objective Description
				figurative language, imagery, allegory, and symbolism, and explain their appeal
			9.3.8	Narrative Analysis of Grade-Level-Appropriate Text: interpret and evaluate the impact of ambiguities, subtleties, contradictions, ironies, and incongruities in a text
			9.3.9	Narrative Analysis of Grade-Level-Appropriate Text: explain how voice, persona, and the choice of a narrator affect characterization and the tone, plot, and credibility of a text
MA	2.1	Students will identify, analyze, and apply knowledge of the themes, structure, and elements of drama and provide evidence from the text to support their understanding.	2.10.1	Identify and analyze how dramatic conventions support, interpret, and enhance dramatic text.
	2.6	Students will identify, analyze, and apply knowledge of the purpose, structure, and elements of nonfiction or informational materials and provide evidence from the text to support their understanding.	2.6.2	Analyze and explain the structure and elements of nonfiction works.
	2.7	Students will identify, analyze, and apply knowledge of the theme, structure, and elements of poetry and provide evidence from the text to support their understanding.	2.7.1	Identify, respond to, and analyze the effects of sound, form, figurative language, graphics, and dramatic structure of poems: sound (alliteration, onomatopoeia, rhyme scheme, consonance, assonance); form (ballad, sonnet, heroic couplets); figurative language (personification, metaphor, simile, hyperbole, symbolism); and dramatic structure.
NY	2.1	LISTENING & READING for literary response involves comprehending, interpreting, and critiquing imaginative texts in every medium, drawing on personal experiences and knowledge to understand the text, and recognizing the social, historical and cultural features of the text.	2.1.3	Recognize and understand the significance of a wide range of literary elements and techniques, (including figurative language, imagery, allegory, irony, blank verse, symbolism, stream-of-consciousness) and use those elements to interpret the work
TX	2	The student will demonstrate an understanding of the effects of literary elements and techniques in culturally diverse written texts.	2.2	The student analyzes literary elements for their contributions to meaning in literary texts. The student is expected to compare and contrast varying aspects of texts such as themes, conflicts, and allusions; analyze relevance of setting and time frame to text's meaning; describe and analyze the development of plot and identify conflicts and how they are addressed and resolved; analyze [the melodies of] literary language, including its use of evocative words and rhythms; connect literature to historical contexts, current events, [and his/her own experiences]; and understand literary forms and terms such as author, drama, biography, autobiography, myth, tall tale, dialogue, tragedy and comedy, [structure in poetry, epic, ballad,] protagonist, antagonist, paradox, analogy, dialect, and comic

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State	Standard ID	Standard Description	Objective ID	Objective Description
	3	The student will demonstrate the ability to analyze and critically evaluate culturally diverse written texts and visual representations.	3.2	relief as appropriate to the selections being read. The student comprehends selections using a variety of strategies. The student is expected to analyze text structures such as compare and contrast, cause and effect, and chronological ordering for how they influence understanding; and draw inferences such as conclusions, generalizations, and predictions and support them with text evidence [and experience].
			3.4	The student expresses and supports responses to various types of texts. The student is expected to use elements of text to defend his/her own responses and interpretations.
			3.5	The student reads critically to evaluate texts and the authority of sources. The student is expected to analyze the characteristics of clearly written texts, including the patterns of organization, syntax, and word choice; evaluate the credibility of information sources, including how the writer's motivation may affect that credibility; and recognize logical, deceptive, and/or faulty modes of persuasion in texts.
WV	1	Students will use skills to read for literacy experiences, read to inform and read to perform a task by: identifying and using the dimensions of reading (phonemic awareness, phonics, background knowledge/vocabulary, high frequency words/fluency, comprehension, writing and motivation to read); and employing a wide variety of literature in developing independent readers.	1.8	Recognize and interpret the author's choice of literary devices (e.g., personification; symbolism; imagery; metaphor; simile; humor; rhythm; rhyme; meter; alliteration; assonance).

Table A.3. ELA Cluster 3: Writing.

CLUSTER 3. WRITING				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 3.1 WRITING APPLICATIONS				
CA	9.2	Students write coherent and focused essays that convey a well-defined perspective and tightly-reasoned argument. The writing demonstrates students' awareness of the audience and purpose. Students progress through the stages of the writing process as needed.	9.2.1	Organization and Focus: establish a controlling impression or coherent thesis that conveys a clear and distinctive perspective on the subject and maintain a consistent tone and focus throughout the piece of writing
			9.2.4	Research and Technology: develop the main ideas within the body of the composition through supportive evidence (e.g., scenarios, commonly held beliefs, hypotheses, definitions)
	9.3	Students combine the rhetorical strategies of narration, exposition, persuasion, and description to produce texts of at least 1,500 words each. Student writing demonstrates a command of standard American English and the research, organizational, and drafting strategies outlined in Writing Standard	9.3.1	Write biographical or autobiographical narratives or short stories: a. Relate a sequence of events and communicate the significance of the events to the audience. b. Locate scenes and incidents in specific places. c. Describe with concrete sensory details the sights, sounds, and smells of a scene and the specific actions, movements, gestures, and feelings of the characters; use interior monologue to depict the characters' feelings. d. Pace the presentation of actions to accommodate changes in time and mood. e. Make effective use of descriptions of appearance, images, shifting perspectives, and sensory details.
			9.3.2	Write responses to literature: a. Demonstrate a comprehensive grasp of the significant ideas of literary works. b. Support important ideas and viewpoints through accurate and detailed references to the text or to other works. c. Demonstrate awareness of the author's use of stylistic devices and an appreciation of the effects created. d. Identify and assess the impact of perceived ambiguities, nuances, and complexities within the text.
			9.3.3	Write expository compositions, including analytical essays and research reports: a. Marshal evidence in support of a thesis and related claims, including information on all relevant perspectives. b. Convey information and ideas from primary and secondary sources accurately and coherently. c. Make distinctions between the relative value and significance of specific data, facts, and ideas. e. Anticipate and address readers' potential misunderstandings, biases, and expectations. f. Use technical terms and notations accurately.
			9.3.4	Write persuasive compositions: a. Structure ideas and arguments in a sustained and logical fashion. b. Use specific rhetorical devices to support assertions (e.g., appeal to logic through reasoning; appeal to

CLUSTER 3. WRITING

State	Standard ID	Standard Description	Objective ID	Objective Description
				emotion or ethical belief; relate a personal anecdote, case study, or analogy). c. Clarify and defend positions with precise and relevant evidence, including facts, expert opinions, quotations, and expressions of commonly accepted beliefs and logical reasoning. d. Address readers' concerns, counterclaims, biases, and expectations.
			9.3.5	Write business letters: a. Provide clear and purposeful information and address the intended audience appropriately. b. Use appropriate vocabulary, tone, and style to take into account the nature of the relationship with, and the knowledge and interests of, the recipients. c. Highlight central ideas or images. d. Follow a conventional style with page formats, fonts, and spacing that contribute to the documents' readability and impact.
MA	3.1	Students will write with a clear focus, coherent organization, and sufficient detail.	3.1.1	For imaginative/literary writing: Write well-organized stories or scripts with an explicit or implicit theme and details that contribute to a definite mood or tone.
			3.1.2	For imaginative/literary writing: Write poems using a range of poetic techniques, forms (sonnet, ballad), and figurative language.
			3.1.3	For informational/expository writing: Write well-organized essays (persuasive, literary, personal) that have a clear focus, logical development, effective use of detail, and variety in sentence structure.
			3.1.4	Write well-organized research papers that prove a thesis statement using logical organization, effective supporting evidence, and variety in sentence structure.
	3.2	Students will write for different audiences and purposes.	3.2.1	Use different levels of formality, style, and tone when composing for different audiences.
	3.5	Students will organize ideas in writing in a way that makes sense for their purpose.	3.5.1	Integrate all elements of fiction to emphasize the theme and tone of the story.
			3.5.2	Organize ideas for a critical essay about literature or a research report with an original thesis statement in the introduction, well constructed paragraphs that build an effective argument, transition sentences to link paragraphs into a coherent whole, and a conclusion.
NC	1	The learner will express reflections and reactions to print and non-print text and personal experiences.	1.1	Narrate personal experiences that offer an audience: scenes and incidents located effectively in time and place; vivid impressions of being in a setting and a sense of engagement in the events occurring; appreciation for the significance of the account; a sense of the narrator's personal voice.
			1.2	Respond reflectively (individually and in groups) to a variety of

CLUSTER 3. WRITING

State	Standard ID	Standard Description	Objective ID	Objective Description
				expressive texts (e.g., memoirs, vignettes, narratives, diaries, monologues, personal responses) in a way that offers an audience: an understanding of the student's personal reaction to the text; a sense of how the reaction results from a careful consideration of the text; an awareness of how personal and cultural influences affect the response.
NY	1.2	SPEAKING & WRITING to acquire and transmit information requires asking probing and clarifying questions, interpreting information in one's own words, applying information from one context to another, and presenting the information and interpretation clearly, concisely, and comprehensibly.	1.2.1	Write and present research reports, feature articles, and thesis/support papers on a variety of topics related to all school subjects
			1.2.3	Use a wide range of organizational patterns such as chronological, logical (both deductive and inductive), cause and effect, and compare/contrast
			1.2.6	Use standard English skillfully, applying established rules and conventions for presenting information and making use of a wide range of grammatical constructions and vocabulary to achieve an individual style that communicates effectively
	2.2	SPEAKING & WRITING for literary response involves presenting interpretations, analysis, and reactions to the content and language of a text. Speaking and writing for literary expression involves producing imaginative texts that use language and text structures that are inventive and often multilayered.	2.2.1	Present responses to and interpretations of works of recognized literary merit with references to the principal features of the genre, the period, and literary tradition, and drawing on their personal experiences and knowledge
			2.2.2	Produce literary interpretations that explicate the multiple layers of meaning
			2.2.3	Write original pieces in a variety of literary forms, correctly using the conventions of the genre and using structure and vocabulary to achieve an effect
			2.2.4	Use standard English skillfully and with an individual style
	3.2	SPEAKING & WRITING for critical analysis and evaluation requires presenting opinions and judgments on experiences, ideas, information, and issues clearly, logically, and persuasively with reference to specific criteria on which the opinion or judgment is based.	3.2.1	Present orally and in writing welldeveloped analysis of issues, ideas, and texts, explaining the rationale for their positions and analyzing their positions from a variety of perspectives in such forms as formal speeches, debates, thesis/support papers, literary critiques, and issues analysis
			3.2.2	Make effective use of details, evidence, and arguments and of presentational strategies to influence an audience to adopt their

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State	Standard ID	Standard Description	Objective ID	Objective Description
			3.2.3	position Monitor and adjust their own oral and written presentations to have the greatest influence on a particular audience
	4.1	LISTENING & SPEAKING Oral communication in formal and informal settings requires the ability to talk with people of different ages, genders, and cultures, to adapt presentations to different audiences, and to reflect on how talk varies in different situations.	4.1.2	Express their thoughts and views clearly with attention to the perspectives and voiced concerns of the others in the conversation
	4.2	READING & WRITING Written communication for social interaction requires using written messages to establish, maintain, and enhance personal relationships with others.	4.2.2	Make effective use of language and style to connect the message with the audience and context
SC		The student will use a process approach to write for a variety of purposes		Compare and contrast universal literary themes within and between texts. Tested by multiple-choice items and an extended-response prompt. The student's extended response will be scored using a 15-point rubric that focuses on the following domains: Content/Development Organization Voice Conventions Generate drafts that use a logical progression of ideas to develop a topic for a specific audience to explain, inform, describe, persuade, and analyze.
				Generate drafts that use a logical progression of ideas to develop a topic for a specific audience to explain, inform, describe, persuade, and analyze.
				Compare and contrast authors' styles on the basis of such elements as word choice and sentence structure (syntax) within and between texts. In responding to test questions, the student may be asked to compare and contrast an author's word choice and syntax within text; and compare and contrast authors' word choices and syntax in two or more texts.
				Develop an extended response around a central idea, using relevant supporting details.
TX	4	The student will, within a given context, produce an effective composition for a specific purpose.	4.1	The student writes in a variety of forms, including business, personal, literary, and persuasive texts, for various audiences and purposes. The student is expected to write in a voice and a style appropriate to audience and purpose; and organize ideas in writing to ensure coherence, logical progression, and support for ideas.
			4.2	The student uses recursive writing processes when appropriate. The student is expected to develop drafts [both alone and collaboratively] by organizing and reorganizing content and by refining style to suit

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State	Standard ID	Standard Description	Objective ID	Objective Description
WV	2	Students will employ a wide range of writing strategies to communicate effectively for different purposes by: developing the writing process; applying grammatical and mechanical properties in writing; and gathering and using information for research purposes.	2.5	occasion, audience, and purpose; and proofread writing for appropriateness of organization, content, style, and conventions. Develop timed and untimed writing that is focused and coherent and has a clear, logical progression of ideas.
			2.8	Develop a composition where word choice is vivid, precise and economical.
SUBCLUSTER 3.2 WRITING CONVENTIONS				
CA	9.1	The standards for written and oral English language conventions have been placed between those for writing and for listening and speaking because these conventions are essential to both sets of skills.	9.1.1	Grammar and Mechanics of Writing: identify and correctly use clauses (e.g., main and subordinate), phrases (e.g., gerund, infinitive, and participial), and mechanics of punctuation (e.g., semi-colons, colons, ellipses, hyphens)
			9.1.2	Grammar and Mechanics of Writing: understand sentence construction (e.g., parallel structure, subordination, proper placement of modifiers) and proper English usage (e.g., consistency of verb tenses)
			9.1.3	Grammar and Mechanics of Writing: demonstrate an understanding of proper English usage and control of grammar, paragraph and sentence structure, diction, and syntax
	9.2	Students write coherent and focused essays that convey a well-defined perspective and tightly-reasoned argument. The writing demonstrates students' awareness of the audience and purpose. Students progress through the stages of the writing process as needed.	9.2.2	Organization and Focus: use precise language, action verbs, sensory details, appropriate modifiers, and the active rather than the passive voice
MA	1.5	Students will analyze standard English grammar and usage and recognize how its vocabulary has developed and been influenced by other languages.	1.5.1	Identify simple, compound, complex, and compound-complex sentences.
			1.5.2	Identify nominalized, adjectival, and adverbial clauses.
			1.5.3	Recognize the functions of verbals: participles, gerunds, and infinitives.
			1.5.4	Analyze the structure of a sentence (traditional diagram, transformational model).
			1.5.5	Identify rhetorically functional sentence structure (parallelism, properly placed modifiers).
			1.5.6	Identify correct mechanics (semicolons, colons, hyphens), correct usage (tense consistency), and correct sentence structure (parallel

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State	Standard ID	Standard Description	Objective ID	Objective Description
				structure).
	3.4	Students will use knowledge of standard English conventions in their writing, revising, and editing.	3.4.1	Use knowledge of types of clauses (main and subordinate), verbals (gerunds, infinitives, participles), mechanics (semicolons, colons, hyphens), usage (tense consistency), sentence structure (parallel structure), and standard English spelling when writing and editing.
NC	6	The learner will apply conventions of grammar and language usage.	6.1	Demonstrate an understanding of conventional written and spoken expression that: uses varying sentence types (e.g., simple, compound, complex, compound-complex) purposefully, correctly, and for specific effect; selects verb tense to show an appropriate sense of time; applies parts of speech to clarify and edit language; addresses clarity and style through such strategies as parallelism; appropriate coordination and subordination; variety and details; appropriate and exact words; and conciseness; analyzes the place and role of dialects and standard/nonstandard English; uses vocabulary strategies such as roots and affixes, word maps, and context clues to discern the meanings of words.
TX	5	The student will produce a piece of writing that demonstrates a command of the conventions of spelling, capitalization, punctuation, grammar, usage, and sentence structure.	5.2	The student relies increasingly on the conventions and mechanics of written English, including the rules of usage and grammar, to write clearly and effectively. The student is expected to produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization [such as italics and ellipses]; demonstrate control over grammatical elements such as subject-verb agreement, pronoun-antecedent agreement, verb forms, and parallelism; and compose increasingly more involved sentences that contain gerunds, participles, and infinitives in their various functions.
	6	The student will demonstrate the ability to revise and proofread to improve the clarity and effectiveness of a piece of writing.	6.2	The student relies increasingly on the conventions and mechanics of written English, including the rules of usage and grammar, to write clearly and effectively. The student is expected to produce legible work that shows accurate spelling and correct use of the conventions of punctuation and capitalization [such as italics and ellipses]; demonstrate control over grammatical elements such as subject-verb agreement, pronoun-antecedent agreement, verb forms, and parallelism; compose increasingly more involved sentences that contain gerunds, participles, and infinitives in their various functions; and produce error-free writing in the final draft.
WV	2	Students will employ a wide range of writing strategies to communicate effectively for different purposes by: developing	2.	Apply note-taking skills to process and organize information (e.g., paraphrase; summary; quote).

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State	Standard ID	Standard Description	Objective ID	Objective Description
		the writing process; applying grammatical and mechanical properties in writing; and gathering and using information for research purposes.		
			2.1	Access and evaluate a variety of sources (e.g., Reader's Guide; card catalog; electronic media; newspapers).
			2.13	Organize text and composition information in outline by selecting main points and supporting details.
			2.14	Practice correct use of bibliographic format in research documentation (e.g., MLA; APA).
			2.16	Classify the parts of speech within a sentence.
			2.17	Recognize the parts of a sentence (e.g., direct object; predicate adjective; gerund; infinitive; word usage variations).
			2.19	Use correct verb tense by recognizing appropriate situations for tense shifts.
			2.3	Use various points of view (e.g., omniscient or limited) to create a well-developed composition from a writing prompt.
			2.4	Use a clearly worded and correctly placed thesis statement which is supported by relevant details to develop a composition that addresses the assigned topic.
			2.6	Use different transitional devices (e.g., introductory and internal transitional phrases/conjunctions).
			2.7	Develop a composition that contains sentence variety.
SUBCLUSTER 3.3 WRITING STRATEGIES				
CA	9.2	Students write coherent and focused essays that convey a well-defined perspective and tightly-reasoned argument. The writing demonstrates students' awareness of the audience and purpose. Students progress through the stages of the writing process as needed.	9.2.9	Evaluation and Revision: revise writing to improve the logic and coherence of the organization and controlling perspective, the precision of word choice, and the tone by taking into consideration the audience, purpose, and formality of the context
MA	3.3	Students will demonstrate improvement in organization, content, paragraph development, level of detail, style, tone, and word choice (diction) in their compositions after revising them.	3.3.1	Revise writing by attending to topic/idea development, organization, level of detail, language/style, sentence structure, grammar and usage, and mechanics.
	3.7	Students will develop and use appropriate rhetorical, logical, and stylistic criteria for assessing final versions of their compositions or research projects before presenting them to varied audiences.	3.7.1	Use group-generated criteria for evaluating different forms of writing and explain why these are important before applying them.
NC	6	The learner will apply conventions of grammar and language usage.	6.2	Discern and correct errors in spoken and written English by: avoiding fragments, run-ons, and comma splices; selecting correct subject-verb agreement, consistent verb tense, and appropriate verbs;

CLUSTER 3. WRITING

State	Standard ID	Standard Description	Objective ID	Objective Description
				using and placing modifiers correctly; editing for spelling and mechanics (punctuation and capitalization).
NY	1.2	SPEAKING & WRITING to acquire and transmit information requires asking probing and clarifying questions, interpreting information in one's own words, applying information from one context to another, and presenting the information and interpretation clearly, concisely, and comprehensibly.	1.2.5	Revise and improve early drafts by restructuring, correcting errors, and revising for clarity and effect
SC		The student will use a process approach to write for a variety of purposes		Edit for language conventions such as spelling, capitalization, punctuation, agreement, sentence structure, and word usage. In responding to test questions, the student may need to consider the following: Capitalization Punctuation Spelling Titles (capitalization, punctuation of) Usage Verb tense and subject/verb agreement Word choice
				Revise writing for clarity, sentence variety, precise vocabulary, and effective phrasing through self-evaluation. In responding to test questions, the student may need to consider the following: Clarity; Effective phrasing; Modifiers (dangling, misplaced); Parallel structure; Precise vocabulary; Sentence combining; Sentence structure; Sentence variety;
TX	4	The student will, within a given context, produce an effective composition for a specific purpose.	4.3	The student evaluates his/her own writing and the writings of others. The student is expected to evaluate writing for both mechanics and content.
	5	The student will produce a piece of writing that demonstrates a command of the conventions of spelling, capitalization, punctuation, grammar, usage, and sentence structure.	5.1	The student uses recursive writing processes when appropriate. The student is expected to proofread writing for appropriateness of organization, content, style, and conventions.
			5.3	The student evaluates his/her own writing and the writings of others. The student is expected to evaluate writing for both mechanics and content.
	6	The student will demonstrate the ability to revise and proofread to improve the clarity and effectiveness of a piece of writing.	6.1	The student uses recursive writing processes when appropriate. The student is expected to proofread writing for appropriateness of organization, content, style, and conventions.
			6.3	The student evaluates his/her own writing and the writings of others. The student is expected to evaluate writing for both mechanics and content.
WV	2	Students will employ a wide range of writing strategies to	2.1	Re-employ writing strategies to address specific audiences (e.g.,

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State	Standard ID	Standard Description	Objective ID	Objective Description
		communicate effectively for different purposes by: developing the writing process; applying grammatical and mechanical properties in writing; and gathering and using information for research purposes.		narrative; expository; descriptive; persuasive).
			2.18	Recognize and correct errors in subject/verb agreement with emphasis on indefinite pronouns.
			2.2	Use pre-writing strategies to generate topics and plan approaches to writing by using timed writing tasks.
			2.2	Recognize and correct errors in sentence structure (e.g., parallelism; redundancy; misplaced modifiers; subordination).
			2.9	Correct errors in timed and untimed writing to correct errors in organization, content, usage, mechanics (e.g., capitalization; punctuation) and spelling using revision and editing strategies.

Table A.4. ELA Cluster 4: Communication.

CLUSTER 4. COMMUNICATION				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 4.1 PRESENTATION SKILLS				
MA	1.1	Students will use agreed-upon rules for informal and formal discussions in small and large groups.	1.1.1	Identify and practice techniques such as setting time limits for speakers and deadlines for decision-making to improve productivity of group discussions.
	1.2	Students will pose questions, listen to the ideas of others, and contribute their own information or ideas in group discussions or interviews in order to acquire new knowledge.	1.2.1	Summarize in a coherent and organized way information and ideas learned from a focused discussion.
	1.3	Students will make oral presentations that demonstrate appropriate consideration of audience, purpose, and the information to be conveyed.	1.3.1	Give formal and informal talks to various audiences and for various purposes using appropriate level of formality and rhetorical devices.
			1.3.2	Analyze effective speeches made for a variety of purposes and prepare and deliver a speech containing some of these features.
			1.3.3	Create an appropriate scoring guide to prepare, improve, and assess presentations.
			2.11.1	Develop, communicate, and sustain consistent characters in improvisational, formal, and informal productions and create scoring guides with categories and criteria for assessment of presentations.
NC	2	The learner will explain meaning, describe processes, and answer research questions to inform an audience.	2.2	Explain commonly used terms and concepts by: clearly stating the subject to be defined; classifying the terms and identifying distinguishing characteristics; organizing ideas and details effectively; using description, comparison, figurative language, and other appropriate strategies purposefully to elaborate ideas; demonstrating a clear sense of audience and purpose.
			2.3	Instruct an audience in how to perform specific operations or procedures by: considering the audience's degree of knowledge or understanding; providing complete and accurate information; using visuals and media to make presentations/products effective; using layout and design elements to enhance presentation/product.
	4	The learner will create and use standards to critique communication.	4.1	Evaluate the effectiveness of communication by: examining the use of strategies in a presentation/product; applying a set of predetermined standards; creating an additional set of standards and applying them to the presentation/product; comparing effective strategies used in different presentations/products.

CLUSTER 4. COMMUNICATION

State	Standard ID	Standard Description	Objective ID	Objective Description
NY	3.2	SPEAKING & WRITING for critical analysis and evaluation requires presenting opinions and judgments on experiences, ideas, information, and issues clearly, logically, and persuasively with reference to specific criteria on which the opinion or judgment is based.	3.2.4	Use standard English, a broad and precise vocabulary, and the conventions of formal oratory and debate
	4.1	LISTENING & SPEAKING Oral communication in formal and informal settings requires the ability to talk with people of different ages, genders, and cultures, to adapt presentations to different audiences, and to reflect on how talk varies in different situations.	4.1.1	Engage in conversations and discussions on academic, technical, and community subjects, anticipating listeners' needs and skillfully addressing them
			4.1.3	Use appropriately the language conventions for a wide variety of social situations, such as informal conversations, first meetings with peers or adults, and more formal situations such as job interviews or customer service
WV	3	Students will apply their use of spoken, written and/or visual language to communicate with a variety of audiences and for different purposes.	3.1	Communicate and follow intricate directions.
			3.2	Employ appropriate classroom communication skills (e.g., asking and answering questions to foster comprehension and communication in appropriate tone and at the appropriate time).
			3.3	Listen to a speech (e.g., funeral orations from Shakespeare's Julius Caesar) to identify specific examples of central idea, fact versus opinion and persuasive devices).
			3.4	Recognize and correct usage errors in oral language (e.g., distinguishing colloquial - dialectical - slang - formal versus informal).
			3.5	Practice and master listening, speaking and viewing by using a variety of techniques (e.g., videos, power point presentations; audiotape; web pages).
SUBCLUSTER 4.2 RESEARCH				
CA	9.2	Students write coherent and focused essays that convey a well-defined perspective and tightly-reasoned argument. The writing demonstrates students' awareness of the audience and purpose. Students progress through the stages of the writing process as needed.	9.2.5	Research and Technology: synthesize information from multiple sources and identify complexities and discrepancies in the information and the different perspectives found in each medium (e.g., almanacs, microfiche, news sources, in-depth field studies, speeches, journals, technical documents)
MA	3.6	Students will gather information from a variety of sources, analyze and evaluate the quality of the information they obtain, and use it to answer their own questions.	3.6.1	Formulate open-ended research questions and apply steps for obtaining and evaluating information from a variety of sources, organizing information, documenting sources in a consistent and

CLUSTER 4. COMMUNICATION

State	Standard ID	Standard Description	Objective ID	Objective Description
				standard format, and presenting research.
		The student will select a topic for exploration, gather information from a variety of sources, and use a variety of strategies to prepare and present the information.		Ask questions to guide research inquiry.
				Gather and evaluate information for its relevance to one's research questions. In responding to test questions, students may be asked to evaluate relevance of information and sources; and organize and classify information by categorizing and sequencing.
				Evaluate credibility of sources, including consideration of accuracy and bias.
				Ask questions to investigate all aspects of a topic, including various viewpoints
SUBCLUSTER 4.3 MEDIA				
MA	1.6	Students will describe, analyze, and use appropriately formal and informal English.	1.6.2	Identify differences between the voice, tone, diction, and syntax used in media presentations (documentary films, news broadcasts, taped interviews) and these elements in informal speech.
	4.1	Students will identify, analyze, and apply knowledge of the conventions, elements, and techniques of film, radio, video, television, multimedia productions, the Internet, and emerging technologies, and provide evidence from the works to support their understanding.	4.1.1	Analyze visual or aural techniques used in a media message for a particular audience and evaluate their effectiveness.
	4.2	Students will design and create coherent media productions (audio, video, television, multimedia, Internet, emerging technologies) with a clear controlling idea, adequate detail, and appropriate consideration of audience, purpose, and medium.	4.2.1	Create media presentations that effectively use graphics, images, and/or sound to present a distinctive point of view on a topic.
			4.2.2	Develop and apply criteria for assessing the effectiveness of the presentation, style, and content of films and other forms of electronic communication.
NY	4.2	READING & WRITING Written communication for social interaction requires using written messages to establish, maintain, and enhance personal relationships with others.	4.2.1	Use a variety of print and electronic forms for social communication with peers and adults
TX	3	The student will demonstrate the ability to analyze and critically evaluate culturally diverse written texts and visual representations.	3.6	The student understands and interprets visual representations. The student is expected to analyze relationships, ideas, [and cultures] as represented in various media; and distinguish the purposes of various media forms such as informative texts, entertaining texts, and advertisements.

CLUSTER 4. COMMUNICATION

State	Standard ID	Standard Description	Objective ID	Objective Description
			3.7	The student analyzes and critiques the significance of visual representations. The student is expected to deconstruct media to get the main idea of the message's content; and evaluate and critique the persuasive techniques of media messages such as glittering generalities, logical fallacies, and symbols.
WV	2	Students will employ a wide range of writing strategies to communicate effectively for different purposes by: developing the writing process; applying grammatical and mechanical properties in writing; and gathering and using information for research purposes.	2.12	Explain the concept of intellectual property and plagiarism in all media (e.g., media copyright laws; public/private domain).
SUBCLUSTER 4.4 CULTURAL COMMUNICATION				
NC	2	The learner will explain meaning, describe processes, and answer research questions to inform an audience.	2.4	Form and refine a question for investigation, using a topic of personal choice, and answer that question by: deciding upon and using appropriate methods such as interviews with experts, observations, finding print and non-print sources, and using interactive technology or media; prioritizing and organizing the information; incorporating effective media and technology to inform or explain; reporting (in written and/or presentational form) the research in an appropriate form for a specified audience.
NY	4.2	READING & WRITING Written communication for social interaction requires using written messages to establish, maintain, and enhance personal relationships with others.	4.2.3	Study the social conventions and language conventions of writers from other groups and cultures and use those conventions to communicate with members of those groups

Math Clusters

Table A.5. Math Cluster 1: Number Sense

CLUSTER 1. NUMBER SENSE				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 1.1 NUMBER PROPERTIES				
CA	7.1.0	Students know the properties of, and compute with, rational numbers expressed in a variety of forms:	7.1.1	Read, write, and compare rational numbers in scientific notation (positive and negative powers of 10) with approximate numbers using scientific notation.
	7.2.0	Students use exponents, powers, and roots and use exponents in working with fractions:	7.2.1	Understand negative whole-number exponents. Multiply and divide expressions involving exponents with a common base.
			7.2.5	Understand the meaning of the absolute value of a number; interpret the absolute value as the distance of the number from zero on a number line; and determine the absolute value of real numbers.
FL	1	The student understands the different ways numbers are represented and used in the real world.	1.1.1	associates verbal names, written word names, and standard numerals with integers, rational numbers, irrational numbers, real numbers, and complex numbers.
			1.1.2	understands the relative size of integers, rational numbers, irrational numbers, and real numbers.
			1.1.3	understands concrete and symbolic representations of real and complex numbers in real-world situations.
			1.1.4	understands that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, radicals, absolute value, and logarithms.
	1	The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.	1.2.1	understands and explains the effects of addition, subtraction, multiplication, and division on real numbers, including square roots, exponents, and appropriate inverse relationships.
MA	1	Understand numbers, ways of representing numbers, relationships among numbers, and number systems; Understand meanings of operations and how they relate to one another; Compute fluently and make reasonable estimates		Simplify numerical expressions, including those involving positive integer exponents or the absolute value, e.g., $3(2^4 - 1) = 45$, $4 3 - 5 + 6 = 14$; apply such simplifications in the solution of problems.

CLUSTER 1. NUMBER SENSE

State	Standard ID	Standard Description	Objective ID	Objective Description
	1	Understand numbers, ways of representing numbers, relationships among numbers, and number systems; Understand meanings of operations and how they relate to one another; Compute fluently and make reasonable estimates		Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties; the existence of the identity and inverse elements for addition and multiplication; the existence of n^{th} roots of positive real numbers for any positive integer n ; and the inverse relationship between taking the n^{th} root of and the n^{th} power of a positive real number.
NY	2	Students use number sense and numeration to develop an understanding of the multiple uses of numbers in the real world, the use of numbers to communicate mathematically, and the use of numbers in the development of mathematical ideas.	2.1	Understand and use rational and irrational numbers.
			2.2	Recognize the order of the real numbers.
			2.3	Apply the properties of the real numbers to various subsets of numbers.
OH	1	Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.	1.1	Use scientific notation to express large numbers and numbers less than one.
			1.2	Identify subsets of the real number system.
				Compare, order and determine equivalent forms of real numbers.
				Connect physical, verbal and symbolic representations of integers, rational numbers and irrational numbers.
SC	1	The student will understand numbers, ways of representing numbers, and relationships among numbers, and number systems		Represent a number using scientific notation in applied situations.
	1	the student will compute with rational numbers and make reasonable estimates in applied situations.		Represent a percent as a decimal or fraction and vice versa.
				Perform operations of addition, subtraction, and scalar multiplication to solve problems using matrices in applied situations.
				Use number sense.
				Find square roots.
				Compare and order fractions, decimals, and percents.
				Apply the commutative, associative, distributive, equality, and identity properties, including order of operations, to simplify mathematical expressions, equations, and inequalities.
WV	1	Students will: demonstrate understanding of numbers, ways of representing numbers, and relationships among numbers and	1.2	Write numbers involving scientific notation and combine numbers written in scientific notation to solve practical problems.

CLUSTER 1. NUMBER SENSE

State	Standard ID	Standard Description	Objective ID	Objective Description
		number systems; demonstrate meanings of operations and how they relate to one another; and compute fluently and make reasonable estimates through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.		
SUBCLUSTER 1.2 NUMBER OPERATIONS				
CA	7.1.0	Students know the properties of, and compute with, rational numbers expressed in a variety of forms:	7.1.2	Add, subtract, multiply, and divide rational numbers (integers, fractions, and terminating decimals) and take positive rational numbers to whole-number powers.
			7.1.3	Convert fractions to decimals and percents and use these representations in estimations, computations, and applications.
			7.1.6	Calculate the percentage of increases and decreases of a quantity.
			7.1.7	Solve problems that involve discounts, markups, commissions, and profit and compute simple and compound interest.
	7.2.0	Students use exponents, powers, and roots and use exponents in working with fractions:	7.2.2	Add and subtract fractions by using factoring to find common denominators.
			7.2.3	Multiply, divide, and simplify rational numbers by using exponent rules.
		Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed	2	Students understand and use such operations as taking the opposite, finding the reciprocal, taking a root, and raising to a fractional power. They understand and use the rules of exponents.
FL	1	The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.	1.2.3	adds, subtracts, multiplies, and divides real numbers, including square roots and exponents, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator.
OH	1	Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.		Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.
				Estimate, compute and solve problems involving scientific notation, square roots and numbers with integer exponents.
				Find the square root of perfect squares, and approximate the square root of non-perfect squares.

CLUSTER 1. NUMBER SENSE

State	Standard ID	Standard Description	Objective ID	Objective Description
SC	1	the student will compute with rational numbers and make reasonable estimates in applied situations.		Use computational skills to solve applied problems with ratios and proportions. Add, subtract, multiply, and divide rational numbers (e.g., fractions, decimals, percents, integers) in real-world situations. Use the laws of exponents.
		The student will understand and apply patterns, relations, and functions.		
WV	1	Students will: demonstrate understanding of numbers, ways of representing numbers, and relationships among numbers and number systems; demonstrate meanings of operations and how they relate to one another; and compute fluently and make reasonable estimates through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	1.1	Solve computational and practical problems using properties of numbers, order of operation, computation, and estimation with decimals, fractions, integers, and mixed numbers, including ratio, proportion, and percents.
			1.3	Estimate and simplify square roots into both exact and approximate forms.
SUBCLUSTER 1.3 ESTIMATION				
CA	7.2.0	Students use strategies, skills, and concepts in finding solutions:	7.2.1	Use estimation to verify the reasonableness of calculated results.
	7.2.0	Students use exponents, powers, and roots and use exponents in working with fractions:	7.2.4	Use the inverse relationship between raising to a power and extracting the root of a perfect square integer; for an integer that is not square, determine without a calculator the two integers between which its square root lies and explain why.
FL	1	The student uses estimation in problem solving and computation.	1.3.1	uses estimation strategies in complex situations to predict results and to check the reasonableness of results.
MA	1	Understand numbers, ways of representing numbers, relationships among numbers, and number systems; Understand meanings of operations and how they relate to one another; Compute fluently and make reasonable estimates		Find the approximate value for solutions to problems involving square roots and cube roots without the use of a calculator.
				Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers.
SC	1	the student will compute with rational numbers and make reasonable estimates in applied situations.		Determine mathematically reasonable solutions using supporting data. Use rounding skills to estimate computations.

Table A.6. Math Cluster 2: Algebra

CLUSTER 2. ALGEBRA				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 2.1 EQUATIONS				
CA	7.1.0	Students express quantitative relationships by using algebraic terminology, expressions, equations, inequalities, and graphs:	7.1.1	Use variables and appropriate operations to write an expression, an equation, an inequality, or a system of equations or inequalities that represents a verbal description (e.g., three less than a number, half as large as area A).
			7.1.2	Use the correct order of operations to evaluate algebraic expressions such as $3(2x + 25)$.
	7.4.0	Students solve simple linear equations and inequalities over the rational numbers:	7.4.1	Solve two-step linear equations and inequalities in one variable over the rational numbers, interpret the solution or solutions in the context from which they arose, and verify the reasonableness of the results.
			7.4.2	Solve multistep problems involving rate, average speed, distance, and time or a direct variation.
		Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed	3	Students solve equations and inequalities involving absolute values.
			4	Students simplify expressions before solving linear equations and inequalities in one variable, such as $3(2x-5) + 4(x-2) = 12$.
			5	Students solve multistep problems, including word problems, involving linear equations and linear inequalities in one variable and provide justification for each step.
			15	Students apply algebraic techniques to solve rate problems, work problems, and percent mixture problems.
FL	4	The student uses expressions, equations, inequalities, graphs, and formulas to represent and interpret situations.	4.2.2	uses systems of equations and inequalities to solve real-world problems graphically, algebraically, and with matrices.
MA	3	Understand patterns, relations, and functions Represent and analyze mathematical situations and structures using algebraic symbols; Use mathematical models to represent and understand quantitative relationships; Analyze change in various contexts.		Solve equations and inequalities including those involving absolute value of linear expressions (e.g., $ x - 2 > 5$) and apply to the solution of problems.
				Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. Apply appropriate tabular, graphical, or symbolic methods to the solution. Include compound interest, and direct and inverse variation problems. Use

CLUSTER 2. ALGEBRA

State	Standard ID	Standard Description	Objective ID	Objective Description
				technology when appropriate. Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems.
NY	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.1	Model real-world problems with systems of equations and inequalities.
	7	Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently		Apply linear, exponential, and quadratic functions in the solution of problems.
OH	2	Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.		Solve systems of linear equations involving two variables graphically and symbolically.
				Describe and interpret rates of change from graphical and numerical data.
SC		The student will represent, analyze, and model situations using mathematical structures and algebraic symbols.		Solve linear equations.
				Translate an expression, equation, or inequality from words and vice versa.
				Solve systems of linear equations.
				Evaluate expressions
				Solve linear inequalities.
				Use symbols to represent unknowns.
WV	2	Students will: demonstrate understanding of patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols; use mathematical models to represent and understand quantitative relationships; and analyze change in various contexts through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	2.1	Define variables and solve multi-step linear equations and one-variable inequalities, interpret results on a number line and apply the skills toward solving practical problems.
			2.2	Solve literal equations for a given variable and apply the skills toward solving practical problems.
			2.4	Evaluate and simplify algebraic expressions using Grouping symbols; Order of Operations; Properties of real numbers with justification of steps; Laws of Exponents.

CLUSTER 2. ALGEBRA

State	Standard ID	Standard Description	Objective ID	Objective Description
			2.5	Solve absolute value equations in one variable and interpret the results on a number line.
			2.9	Factor and perform basic operations on simple polynomials.
SUBCLUSTER 2.2 MONOMIALS AND POLYNOMIALS				
CA	7.2.0	Students interpret and evaluate expressions involving integer powers and simple roots:	7.2.1	Interpret positive whole-number powers as repeated multiplication and negative whole-number powers as repeated division or multiplication by the multiplicative inverse. Simplify and evaluate expressions that include exponents.
			7.2.2	Multiply and divide monomials; extend the process of taking powers and extracting roots to monomials when the latter results in a monomial with an integer exponent.
		Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed	10	Students add, subtract, multiply, and divide monomials and polynomials. Students solve multistep problems, including word problems, by using these techniques.
MA	3	Understand patterns, relations, and functions Represent and analyze mathematical situations and structures using algebraic symbols; Use mathematical models to represent and understand quantitative relationships; Analyze change in various contexts.		Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula. Demonstrate an understanding of the equivalence of the methods.
				Add, subtract, and multiply polynomials. Divide polynomials by monomials.
				Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms; factoring (e.g., $a^2 - b^2 = (a + b)(a - b)$, $x^2 + 10x + 21 = (x + 3)(x + 7)$, $5x^4 + 10x^3 - 5x^2 = 5x^2(x^2 + 2x - 1)$); identifying and canceling common factors in rational expressions; and applying the properties of positive integer exponents.
NY	3	Students use mathematical operations and relationships among them to understand mathematics.	3.1	Use addition, subtraction, multiplication, division, and exponentiation with real numbers and algebraic exponents.
			3.3	Explore and use negative exponents on integers and algebraic expressions.
OH	2	Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable		Solve quadratic equations with real roots by graphing, formula and factoring.

CLUSTER 2. ALGEBRA

State	Standard ID	Standard Description	Objective ID	Objective Description
		quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.		
SC		The student will represent, analyze, and model situations using mathematical structures and algebraic symbols.		Solve simple quadratic equations.
				Simplify polynomial expressions.
SUBCLUSTER 2.3 PATTERNS AND FUNCTIONS				
FL	4	The student describes, analyzes, and generalizes a wide variety of patterns, relations, and functions.	4.1.1	describes, analyzes, and generalizes relationships, patterns, and functions using words, symbols, variables, tables, and graphs.
	4		4.1.2	determines the impact when changing parameters of given functions.
	4	The student uses expressions, equations, inequalities, graphs, and formulas to represent and interpret situations.	4.2.1	represents real-world problem situations using finite graphs, matrices, sequences, series, and recursive relations.
MA	3	Understand patterns, relations, and functions Represent and analyze mathematical situations and structures using algebraic symbols; Use mathematical models to represent and understand quantitative relationships; Analyze change in various contexts.		Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative, recursive (e.g., Fibonacci Numbers), linear, quadratic, and exponential functional relationships.
NY	7	Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently		Use computers and graphing calculators to analyze mathematical phenomena.
				Apply axiomatic structure to algebra and geometry.
OH	2	Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.		Model and solve problem situations involving direct and inverse variation.
				Generalize and explain patterns and sequences in order to find the next term and the n th term.
	6	Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.		Recognize and use connections between equivalent representations and related procedures for a mathematical concept; e.g., zero of a function and the x -intercept of the graph of the function, apply proportional thinking when measuring, describing functions, and comparing probabilities.
SC	2	The student will understand and apply patterns, relations, and functions.		find the next term of a pattern or sequence.
		The student will understand and apply patterns, relations, and functions.		Generalize a pattern.
		The student will represent, analyze, and model situations using		Perform polynomial arithmetic.

CLUSTER 2. ALGEBRA

State	Standard ID	Standard Description	Objective ID	Objective Description
		mathematical structures and algebraic symbols.		
		The student will understand and apply patterns, relations, and functions.		Describe, extend, analyze, and create a wide variety of patterns to investigate relationships and solve problems.
		The student will represent, analyze, and model situations using mathematical structures and algebraic symbols.		Represent and translate linear functions as equations and inequalities from tables, and graphs, and vice versa.
		2.4 Graphs of Functions		
CA	7.3.0	Students graph and interpret linear and some nonlinear functions:	7.3.1	Graph functions of the form $y = nx^2$ and $y = nx^3$ and use in solving problems.
			7.3.3	Graph linear functions, noting that the vertical change (change in y-value) per unit of horizontal change (change in x-value) is always the same and know that the ratio (“rise over run”) is called the slope of a graph.
			7.3.4	Plot the values of quantities whose ratios are always the same (e.g., cost to the number of an item, feet to inches, circumference to diameter of a circle). Fit a line to the plot and understand that the slope of the line equals the quantities.
		Symbolic reasoning and calculations with symbols are central in algebra. Through the study of algebra, a student develops an understanding of the symbolic language of mathematics and the sciences. In addition, algebraic skills and concepts are developed	6	Students graph a linear equation and compute the x- and y-intercepts (e.g., graph $2x + 6y = 4$). They are also able to sketch the region defined by linear inequality (e.g., they sketch the region defined by $2x + 6y < 4$).
			7	Students verify that a point lies on a line, given an equation of the line. Students are able to derive linear equations by using the point-slope formula.
			8	Students understand the concepts of parallel lines and perpendicular lines and how those slopes are related. Students are able to find the equation of a line perpendicular to a given line that passes through a given point.
			9	Students solve a system of two linear equations in two variables algebraically and are able to interpret the answer graphically. Students are able to solve a system of two linear inequalities in two variables and to sketch the solution sets.
MA	3	Understand patterns, relations, and functions Represent and analyze mathematical situations and structures using algebraic symbols; Use mathematical models to represent and understand quantitative relationships; Analyze change in various contexts.		Demonstrate an understanding of the relationship between various representations of a line. Determine a line’s slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line from a graph or a geometric

CLUSTER 2. ALGEBRA

State	Standard ID	Standard Description	Objective ID	Objective Description
				description of the line, e.g., by using the “point-slope” or “slope y-intercept” formulas. Explain the significance of a positive, negative, zero, or undefined slope.
	4	Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; Specify locations and describe spatial relationships using coordinate geometry and other representational systems; Apply transformations and use symmetry to analyze mathematical situations; Use visualization, spatial reasoning, and geometric modeling to solve problems .		Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the “point-slope” form of the equation.
NY	3	Students use mathematical operations and relationships among them to understand mathematics.	3.5	Use transformations on figures and functions in the coordinate plane.
	7	Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently		Analyze the effect of parametric changes on the graphs of functions.
OH	2	Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.		Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.
				Analyze and compare functions and their graphs using attributes, such as rates of change, intercepts and zeros.
SC		The student will represent, analyze, and model situations using mathematical structures and algebraic symbols.		Solve and graph linear equations and inequalities. Identify a linear equation given characteristics of the line.
		The student will understand and apply patterns, relations, and functions.		Interpret situations in terms of given graphs.
		The student will analyze characteristics of two- and three-dimensional geometric shapes, understand geometric relationships, and apply spatial relationships using coordinate geometry.		Given two points, find the slope between them.
		The student will represent, analyze, and model situations using mathematical structures and algebraic symbols.		Find specific function values.
		The student will understand and apply patterns, relations, and functions.		Identify situations that can and cannot be represented by a line. Understand the effects of changing the slope and y-intercept on graphs, linear equations, and in applied situations.
WV	2	Students will: demonstrate understanding of patterns, relations, and functions; represent and analyze mathematical situations	2.7	Determine the slope of a line given an equation of a line; the graph of a line; two points to be identified.

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State	Standard ID	Standard Description	Objective ID	Objective Description
		and structures using algebraic symbols; use mathematical models to represent and understand quantitative relationships; and analyze change in various contexts through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.		
			2.8	Write and graph linear equations.

Table A.7. Math Cluster 3: Measurement and Geometry

CLUSTER 3. MEASUREMENT AND GEOMETRY				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 3.1 MEASUREMENT				
CA	7.1.0	Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:	7.1.1	Compare weights, capacities, geometric measures, times, and temperatures within and between measurement systems (e.g., miles per hour and feet per second, cubic inches to cubic centimeters).
			7.1.3	Use measures expressed as rates (e.g., speed, density) and measures expressed as products (e.g., person-days) to solve problems; check the units of the solutions; and use dimensional analysis to check the reasonableness of the answer.
	7.2.0	Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:	7.2.4	Relate the changes in measurement with a change of scale to the units used (e.g., square inches, cubic feet) and to conversions between units (1 square foot = 144 square inches or $[1 \text{ ft}^2] = [144 \text{ in}^2]$, 1 cubic inch is approximately 16.38 cubic centimeters or $[1 \text{ in}^3] = [16.38 \text{ cm}^3]$).
FL	2	The student measures quantities in the real world and uses the measures to solve problems.	2.1.2	uses concrete and graphic models to derive formulas for finding rate, distance, time, angle measures, and arc lengths.
	2	The student compares, contrasts, and converts within systems of measurement (both standard/nonstandard and metric/customary).	2.2.1	selects and uses direct (measured) or indirect (not measured) methods of measurement as appropriate.
			2.2.2	solves real-world problems involving rated measures (miles per hour, feet per second).
	2	The student estimates measurements in real-world problem situations.	2.3.1	solves real-world and mathematical problems involving estimates of measurements, including length, time, weight/mass, temperature, money, perimeter, area, and volume, and estimates the effects of measurement errors on calculations.
MA	5	Understand measurable attributes of objects and the units, systems, and processes of measurement; Apply appropriate techniques, tools, and formulas to determine measurements		Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.
				Relate changes in the measurement of one attribute of an object to changes in other attributes, e.g., how changing the radius or height of a cylinder affects its surface area or volume.
NY	5	Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.	5.2	Choose the appropriate tools for measurement.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
			5.3	Use dimensional analysis techniques.
			5.6	Apply proportions to scale drawings, computer-assisted design blueprints, and direct variation in order to compute indirect measurements.
			5.8	Understand error in measurement and its consequence on subsequent calculations.
			5.9	Use geometric relationships in relevant measurement problems involving geometric concepts.
OH	4	Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.		Use proportional reasoning and apply indirect measurement techniques, including right triangle trigonometry and properties of similar triangles, to solve problems involving measurements and rates.
				Solve increasingly complex non-routine measurement problems and check for reasonableness of results.
				Write and solve real world, multi-step problems involving money, elapsed time and temperature, and verify reasonableness of solutions.
SC		The student will apply appropriate techniques, tools, and formulas to determine measurements and solve problems.		Use dimensional analysis to convert units and check measurement computations.
				Convert and use appropriate units of measure (customary and metric).
WV	4	Students will: demonstrate understanding of measurable attributes of objects and the units, systems, and processes of measurement; and apply appropriate techniques, tools and formulas to determine measurements through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	4.2	Estimate, measure, and perform operations involving length, mass, and capacity using customary and metric units.
			4.3	Use appropriate tools to measure geometric figures.
SUBCLUSTER 3.2 GEOMETRIC PROPERTIES				
CA	7.3.0	Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:	7.3.2	Understand and use coordinate graphs to plot simple figures, determine lengths and areas related to them, and determine their image under translations and reflections.
			7.3.4	Demonstrate an understanding of conditions that indicate two geometrical figures are congruent and what congruence means about the relationships between the sides and angles of the two figures.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
FL	3	The student visualizes and illustrates ways in which shapes can be combined, subdivided, and changed.	3.2.1	understands geometric concepts such as perpendicularity, parallelism, tangency, congruency, similarity, reflections, symmetry, and transformations including flips, slides, turns, enlargements, rotations, and fractals.
MA	4	Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; Specify locations and describe spatial relationships using coordinate geometry and other representational systems; Apply transformations and use symmetry to analyze mathematical situations; Use visualization, spatial reasoning, and geometric modeling to solve problems .		Identify figures using properties of sides, angles, and diagonals. Identify the figures' type(s) of symmetry.
				Demonstrate the ability to visualize solid objects and recognize their projections and cross sections.
				Recognize and solve problems involving angles formed by transversals of coplanar lines. Identify and determine the measure of central and inscribed angles and their associated minor and major arcs. Recognize and solve problems associated with radii, chords, and arcs within or on the same circle.
NY	3	Students use mathematical operations and relationships among them to understand mathematics.	3.2	Develop an understanding of and use the composition of functions and transformations.
	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.6	Investigate transformations in the coordinate plane.
			4.7	Develop meaning for basic conic sections.
	7	Students use patterns and functions to develop mathematical power, appreciate the true beauty of mathematics, and construct generalizations that describe patterns simply and efficiently		Use function vocabulary and notation.
				Model real-world situations with the appropriate function.
				Represent and analyze functions using verbal descriptions, tables, equations, and graphs.
				Apply and interpret transformations to functions.
				Translate among the verbal descriptions, tables, equations and graphic forms of functions.
OH	2	Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities. Students analyze, model and solve problems using various representations such as tables, graphs and equations.		Identify and classify functions as linear or nonlinear, and contrast their properties using tables, graphs or equations.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
				Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.
	3	Students identify, classify, compare and analyze characteristics, properties and relationships of one-, two- and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.		Describe and apply the properties of similar and congruent figures; and justify conjectures involving similarity and congruence.
				Use coordinate geometry to represent and examine the properties of geometric figures.
				Draw and construct representations of two- and three-dimensional geometric objects using a variety of tools, such as straightedge, compass and technology.
				Formally define geometric figures.
SC		The student will analyze characteristics of two- and three-dimensional geometric shapes, understand geometric relationships, and apply spatial relationships using coordinate geometry.		Identify attributes of congruent figures.
				Analyze the properties of spheres, cylinders, prisms and pyramids.
				Identify and apply properties of circles, polygons, and angles.
				Identify the congruent and supplementary relationships of the angles formed by parallel lines and a transversal.
				Identify attributes of similar figures.
WV	2	Students will: demonstrate understanding of patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols; use mathematical models to represent and understand quantitative relationships; and analyze change in various contexts through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	2.6	Analyze a given set of data for the existence of a pattern numerically, algebraically, and graphically.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
	3	Students will: analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; specify locations and describe spatial relationships using coordinate geometry and other representational systems; apply transformations and use symmetry to analyze mathematical situations; and solve problems using visualization, spatial reasoning, and geometric modeling through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	3.1	Use appropriate tools to make geometric constructions.
			3.2	Identify angle relationships and apply in solving problems (complementary, supplementary, vertical and adjacent as well as relationships formed by parallel lines cut by a transversal).
			3.4	Explore circle relationships, emphasizing the vocabulary of circles.
SUBCLUSTER 3.3 SOLVE GEOMETRIC PROBLEMS				
CA	7.1.0	Students choose appropriate units of measure and use ratios to convert within and between measurement systems to solve problems:	7.1.2	Construct and read drawings and models made to scale.
	7.2.0	Students compute the perimeter, area, and volume of common geometric objects and use the results to find measures of less common objects. They know how perimeter, area, and volume are affected by changes of scale:	7.2.1	Use formulas routinely for finding the perimeter and area of basic two-dimensional figures and the surface area and volume of basic three-dimensional figures, including rectangles, parallelograms, trapezoids, squares, triangles, circles, prisms, and cylinders.
			7.2.2	Estimate and compute the area of more complex or irregular two- and three-dimensional figures by breaking the figures down into more basic geometric objects.
			7.2.3	Compute the length of the perimeter, the surface area of the faces, and the volume of a three-dimensional object built from rectangular solids. Understand that when the lengths of all dimensions are multiplied by a scale factor, the surface area is multiplied by the square of the scale factor and the volume is multiplied by the cube of the scale factor.
	7.3.0	Students know the Pythagorean theorem and deepen their understanding of plane and solid geometric shapes by constructing figures that meet given conditions and by identifying attributes of figures:	7.3.3	Know and understand the Pythagorean theorem and its converse and use it to find the length of the missing side of a right triangle and the lengths of other line segments and, in some situations, empirically verify the Pythagorean theorem by direct measurement.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
FL	2	The student measures quantities in the real world and uses the measures to solve problems.	2.1.1	uses concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids, cylinders, cones, and pyramids.
			2.1.3	relates the concepts of measurement to similarity and proportionality in real-world situations.
	3	The student describes, draws, identifies, and analyzes two- and three-dimensional shapes.	3.1.1	uses properties and relationships of geometric shapes to construct formal and informal proofs.
	3	The student visualizes and illustrates ways in which shapes can be combined, subdivided, and changed.	3.2.1	analyzes and applies geometric relationships involving planar cross-sections (the intersection of a plane and a three-dimensional figure).
	3	The student uses coordinate geometry to locate objects in both two and three dimensions and to describe objects algebraically.	3.3.1	represents and applies geometric properties and relationships to solve real-world and mathematical problems including ratio, proportion, and properties of right triangle trigonometry.
3.3.2			using a rectangular coordinate system (graph), applies and algebraically verifies properties of two- and three-dimensional figures, including distance, midpoint, slope, parallelism, and perpendicularity.	
MA	4	Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; Specify locations and describe spatial relationships using coordinate geometry and other representational systems; Apply transformations and use symmetry to analyze mathematical situations; Use visualization, spatial reasoning, and geometric modeling to solve problems .	Use vertex-edge graphs to model and solve problems	
			Apply congruence and similarity correspondences (e.g., DABC @ DXYZ) and properties of the figures to find missing parts of geometric figures, and provide logical justification.	
			Draw the results, and interpret transformations on figures in the coordinate plane, e.g., translations, reflections, rotations, scale factors, and the results of successive transformations. Apply transformations to the solutions of problems.	
			Solve simple triangle problems using the triangle angle sum property and/or the Pythagorean theorem.	
			Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points, and apply the results to the solutions of problems.	

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
				Use the properties of special triangles (e.g., isosceles, equilateral, 30° – 60° – 90° , 45° – 45° – 90°) to solve problems.
	5	Understand measurable attributes of objects and the units, systems, and processes of measurement; Apply appropriate techniques, tools, and formulas to determine measurements		Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.
				Given the formula, find the lateral area, surface area, and volume of prisms, pyramids, spheres, cylinders, and cones, e.g., find the volume of a sphere with a specified surface area.
NY	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.4	Use learning technologies to make and verify geometric conjectures.
	5	Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.	5.1	Derive and apply formulas to find measures such as length, area, volume, weight, time, and angle in real-world contexts.
			5.5	Use trigonometry as a method to measure indirectly.
			5.7	Relate absolute value, distance between two points, and the slope of a line to the coordinate plane.
OH	3	Students identify, classify, compare and analyze characteristics, properties and relationships of one-, two- and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.		Prove or disprove conjectures and solve problems involving two- and three-dimensional objects represented within a coordinate system.
				Represent and model transformations in a coordinate plane and describe the results.
				Recognize and apply angle relationships in situations involving intersecting lines, perpendicular lines and parallel lines.
				Use right triangle trigonometric relationships to determine lengths and angle measures.
	4	Students estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.		Apply indirect measurement techniques, tools and formulas, as appropriate, to find perimeter, circumference and area of circles, triangles, quadrilaterals and composite shapes, and to find volume of prisms, cylinders, and pyramids.
				Use formulas to find surface area and volume for specified three-dimensional objects accurate to a specified level of precision.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
				Estimate and compute various attributes, including length, angle measure, area, surface area and volume, to a specified level of precision.
SC		The student will analyze characteristics of two- and three-dimensional geometric shapes, understand geometric relationships, and apply spatial relationships using coordinate geometry.		Solve applied problems using the Pythagorean Theorem.
				Identify missing coordinates needed to form a specific polygon.
		The student will apply appropriate techniques, tools, and formulas to determine measurements and solve problems.		Find the perimeter and area of 2-dimensional figures.
		The student will analyze characteristics of two- and three-dimensional geometric shapes, understand geometric relationships, and apply spatial relationships using coordinate geometry.		Use proportions to solve problems involving similar figures, including scale drawings.
		The student will apply appropriate techniques, tools, and formulas to determine measurements and solve problems.		Approximate and find volumes and areas for irregular figures.
				Use formulas to find volume and surface areas of 3-dimensional objects (e.g., prisms, pyramids, cylinders).
		The student will analyze characteristics of two- and three-dimensional geometric shapes, understand geometric relationships, and apply spatial relationships using coordinate geometry.		Translate, reflect, rotate, and dilate figures on the coordinate plane.
				Determine the resulting change in the area and volume of a figure when one or more dimensions are changed.
WV	3	Students will: analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; specify locations and describe spatial relationships using coordinate geometry and other representational systems; apply transformations and use symmetry to analyze mathematical situations; and solve problems using visualization, spatial reasoning, and geometric modeling through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	3.3	Investigate similar figures and apply proportions in problem solving situations.
			3.5	Solve right triangle problems using the Pythagorean Theorem.

CLUSTER 3. MEASUREMENT AND GEOMETRY

State	Standard ID	Standard Description	Objective ID	Objective Description
	4	Students will: demonstrate understanding of measurable attributes of objects and the units, systems, and processes of measurement; and apply appropriate techniques, tools and formulas to determine measurements through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	4.1	Calculate the missing measures of angles and lengths of sides of a polygon from given data, using formulas.
			4.4	Develop and apply formulas for area, perimeter, surface area, and volume and apply them in solving practical problems.

Table A.8. Math Cluster 4: Data and Statistics

CLUSTER 4. DATA AND STATISTICS				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 4.1 STATISTICAL PROPERTIES				
CA	6.1.0	Students compute and analyze statistical measurements for data sets:	6.1.1	Compute the range, mean, median, and mode of data sets.
FL	5	The student understands and uses the tools of data analysis for managing information.	5.1.2	calculates measures of central tendency (mean, median, and mode) and dispersion (range, standard deviation, and variance) for complex sets of data and determines the most meaningful measure to describe the data.
			5.1.3	analyzes real-world data and makes predictions of larger populations by applying formulas to calculate measures of central tendency and dispersion using the sample population data, and using appropriate technology, including calculators and computers.
NY	5	Students use measurement in both metric and English measure to provide a major link between the abstractions of mathematics and the real world in order to describe and compare objects and data.	5.4	Use statistical methods including measures of central tendency to describe and compare data.
OH	5	Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.		Find, use and interpret measures of center and spread, such as mean and quartiles, and use those measures to compare and draw conclusions about sets of data.
				Compare the characteristics of the mean, median and mode for a given set of data, and explain which measure of center best represents the data.
SC		The student will use appropriate statistical methods to analyze data and apply basic concepts of probability.		Find the mean, median, mode, and range for a set of data.
WV	5	Students will: formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; select and use appropriate statistical methods to analyze data; develop and evaluate inferences and predictions that are based on models; and apply and demonstrate an understanding of basic concepts of probability through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	5.1	Collect, organize, interpret data, and predict outcomes using the mean, mode, median, range, and standard deviation.
			5.4	Read, interpret and construct graphs to solve problems.

CLUSTER 4. DATA AND STATISTICS

State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 4.2 PROBABILITY				
CA	6.3.0	Students determine theoretical and experimental probabilities and use these to make predictions about events:	6.3.1	Represent all possible outcomes for compound events in an organized way (e.g., tables, grids, tree diagrams) and express the theoretical probability of each outcome.
			6.3.3	Represent probabilities as ratios, proportions, decimals between 0 and 1, and percentages between 0 and 100 and verify that the probabilities computed are reasonable; know that if P is the probability of an event, 1-P is the probability of an event not occurring.
			6.3.5	Understand the difference between independent and dependent events.
FL	5	The student identifies patterns and makes predictions from an orderly display of data using concepts of probability and statistics.	5.2.1	determines probabilities using counting procedures, tables, tree diagrams, and formulas for permutations and combinations.
			5.2.2	determines the probability for simple and compound events as well as independent and dependent events.
NY	6	Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.	6.3	Use experimental or theoretical probability to represent and solve problems involving uncertainty.
			6.4	Use the concept of random variable in computing probabilities.
			6.5	Determine probabilities using permutations and combinations.
OH	5	Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.		Use counting techniques, such as permutations and combinations, to determine the total number of options and possible outcomes.
				Compute probabilities of compound events, independent events, and simple dependent events.
SC		The student will use appropriate statistical methods to analyze data and apply basic concepts of probability.		Represent possible outcomes in the form of an organized list, chart, or tree diagram.
				Calculate the probability of a complementary event.
				Calculate the probability of a simple event.
				Find the number of possible outcomes of an event.

CLUSTER 4. DATA AND STATISTICS

State	Standard ID	Standard Description	Objective ID	Objective Description
WV	5	Students will: formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; select and use appropriate statistical methods to analyze data; develop and evaluate inferences and predictions that are based on models; and apply and demonstrate an understanding of basic concepts of probability through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	5.2	Find the probability of conditional events and mutually exclusive events.
			5.3	Predict the outcomes of simple events using the rules of probability.
SUBCLUSTER 4.3 GRAPHS AND DISPLAYS				
CA	7.1.0	Students collect, organize, and represent data sets that have one or more variables	7.1.1	Know various forms of display for data sets, including a stem-and-leaf plot or box-and-whisker plot ; use the forms to display a single set of data or to compare two sets of data.
			7.1.2	Represent two numerical variables on a scatterplot and informally describe how the data points are distributed and any apparent relationship that exists between the two variables (e.g., between time spent on homework and grade level).
FL	5	The student understands and uses the tools of data analysis for managing information.	5.1.1	interprets data that has been collected, organized, and displayed in charts, tables, and plots.
MA	2	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; Select and use appropriate statistical methods to analyze data; Develop and evaluate inferences and predictions that are based on data; Understand and apply basic concepts of probability.		Select, create, and interpret an appropriate graphical representation (e.g., scatterplot, table, stem-and-leaf plots, box-and-whisker plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.
NY	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.9	Use graphing utilities to create and explore geometric and algebraic models.
	6	Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.	6.2	Judge the reasonableness of a graph produced by a calculator or computer.
OH	5	Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.		Evaluate different graphical representations of the same data to determine which is the most appropriate representation for an identified purpose.

CLUSTER 4. DATA AND STATISTICS

State	Standard ID	Standard Description	Objective ID	Objective Description
				Create, interpret and use graphical displays and statistical measures to describe data; e.g., box-and-whisker plots, histograms, scatterplots, measures of center and variability.
SC		The student will use appropriate statistical methods to analyze data and apply basic concepts of probability.		Represent and interpret data using circle graphs, bar graphs, scatterplots, histograms, stem-and-leaf plots, box-and-whisker plots, and matrices.
SUBCLUSTER 4.4 CORRELATION AND BEST FIT				
MA	2	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; Select and use appropriate statistical methods to analyze data; Develop and evaluate inferences and predictions that are based on data; Understand and apply basic concepts of probability.		Approximate a line of best fit (trend line) given a set of data (e.g., scatterplot). Use technology when appropriate.
SC		The student will use appropriate statistical methods to analyze data and apply basic concepts of probability.		Find the equation of the line that best fits a set of data (line of best fit).
				Determine positive, negative, or no correlation between data.
				Determine the line of best fit.
				Identify the graph of the function that best models a data set.
SUBCLUSTER 4.5 DESIGN/INTERPRET EXPERIMENT				
CA	6.2.0	Students use data samples of a population and describe the characteristics and limitations of the samples:	6.2.5	Identify claims based on statistical data and, in simple cases, evaluate the validity of the claims.
FL	5	The student uses statistical methods to make inferences and valid arguments about real-world situations.	5.3.1	designs and performs real-world statistical experiments that involve more than one variable, then analyzes results and reports findings.
MA	2	Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; Select and use appropriate statistical methods to analyze data; Develop and evaluate inferences and predictions that are based on data; Understand and apply basic concepts of probability.		Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data.
OH	5	Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.		Describe sampling methods and analyze the effects of method chosen on how well the resulting sample represents the population.
				Evaluate the validity of claims and predictions that are based on data by examining the appropriateness of the data collection and analysis.
				Design an experiment to test a theoretical probability, and record and explain results.
				Make predictions based on theoretical probabilities and experimental results.

Table A.9. Math Cluster 5: Mathematical Thinking

CLUSTER 5. MATHEMATICAL THINKING				
State	Standard ID	Standard Description	Objective ID	Objective Description
SUBCLUSTER 5.1 MATH REASONING				
CA	7.1.0	Students make decisions about how to approach problems:	7.1.2	Formulate and justify mathematical conjectures based on a general description of the mathematical question or problem posed.
	7.2.0	Students use strategies, skills, and concepts in finding solutions:	7.2.3	Estimate unknown quantities graphically and solve for them by using logical reasoning and arithmetic and algebraic techniques.
			7.2.4	Make and test conjectures by using both inductive and deductive reasoning.
NY	1	Students use mathematical reasoning to analyze mathematical situations, make conjectures, gather evidence, and construct an argument.	1.1	Construct simple logical arguments.
			1.2	Follow and judge the validity of logical arguments.
			1.3	Use symbolic logic in the construction of valid arguments
			1.4	Construct proofs based on deductive reasoning.
	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.1	Represent problem situations symbolically by using algebraic expressions, sequences, tree diagrams, geometric figures, and graphs.
			4.2	Manipulate symbolic representations to explore concepts at an abstract level.
			4.3	Choose appropriate representations to facilitate the solving of a problem.
			4.8	Develop and apply the concept of basic loci to compound loci.
OH	6	Students use ideas of uncertainty to illustrate that mathematics involves more than exactness when dealing with everyday situations.	6.1	Judge the reasonableness of results obtained from applications in algebra, geometry, trigonometry, probability, and statistics.
	3	Students identify, classify, compare and analyze characteristics, properties and relationships of one-, two- and three-dimensional geometric figures and objects. Students use spatial reasoning, properties of geometric objects, and transformations to analyze mathematical situations and solve problems.		Establish the validity of conjectures about geometric objects, their properties and relationships by counterexample, inductive and deductive reasoning, and critiquing arguments made by others.
	5	Students pose questions and collect, organize, represent, interpret and analyze data to answer those questions. Students develop and evaluate inferences, predictions and arguments that are based on data.		Construct convincing arguments based on analysis of data and interpretation of graphs.

CLUSTER 5. MATHEMATICAL THINKING

State	Standard ID	Standard Description	Objective ID	Objective Description
	6	Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.		Apply reasoning processes and skills to construct logical verifications or counter-examples to test conjectures and to justify and defend algorithms and solutions
SUBCLUSTER 5.2 GENERALIZATION				
CA	7.1.0	Students make decisions about how to approach problems:	7.1.1	Analyze problems by identifying relationships, distinguishing relevant from irrelevant information, identifying missing information, sequencing and prioritizing information, and observing patterns.
	7.3.0	Students use strategies, skills, and concepts in finding solutions:	7.3.3	Develop generalizations of the results obtained and the strategies used and apply them to new problem situations.
FL	5	The student uses statistical methods to make inferences and valid arguments about real-world situations.	5.3.2	explains the limitations of using statistical techniques and data in making inferences and valid arguments.
OH	6	Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.		Formulate a problem or mathematical model in response to a specific need or situation, determine information required to solve the problem, choose method for obtaining this information, and set limits for acceptable solution.
				Apply mathematical knowledge and skills routinely in other content areas and practical situations.
WV	2	Students will: demonstrate understanding of patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols; use mathematical models to represent and understand quantitative relationships; and analyze change in various contexts through communication, representation, reasoning and proof, problem solving, and making connections within and beyond the field of mathematics.	2.3	Solve practical problems using a four-step problem solving approach, justifying steps based on the properties of real numbers.
SUBCLUSTER 5.3 MATH COMMUNICATION				
FL	1	The student understands the effects of operations on numbers and the relationships among these operations, selects appropriate operations, and computes for problem solving.	1.2.2	selects and justifies alternative strategies, such as using properties of numbers, including inverse, identity, distributive, associative, transitive, that allow operational shortcuts for computational procedures in real-world or mathematical problems.
MA	4	Analyze characteristics and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships; Specify locations and describe spatial relationships using coordinate geometry and other representational systems; Apply transformations and use symmetry to analyze mathematical situations; Use visualization, spatial reasoning, and geometric modeling to solve problems .		Draw congruent and similar figures using a compass, straightedge, protractor, and other tools such as computer software. Make conjectures about methods of construction. Justify the conjectures by logical arguments.

CLUSTER 5. MATHEMATICAL THINKING

State	Standard ID	Standard Description	Objective ID	Objective Description
NY	3	Students use mathematical operations and relationships among them to understand mathematics.	3.4	Use field properties to justify mathematical procedures.
	4	Students use mathematical modeling/multiple representation to provide a means of presenting, interpreting, communicating, and connecting mathematical information and relationships.	4.5	Justify the procedures for basic geometric constructions.
OH	1	Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another. Students compute fluently and make reasonable estimates using paper and pencil, technology-supported and mental methods.	1.3	Apply properties of operations and the real number system, and justify when they hold for a set of numbers.
	6	Students use mathematical processes and knowledge to solve problems. Students apply problem-solving and decision-making techniques, and communicate mathematical ideas.		Explain the effects of operations on the magnitude of quantities.
				Use a variety of mathematical representations flexibly and appropriately to organize, record and communicate mathematical ideas.
				Locate and interpret mathematical information accurately, and communicate ideas, processes and solutions in a complete and easily understood manner.
				Write clearly and coherently about mathematical thinking and ideas.
	1	The student will understand numbers, ways of representing numbers, and relationships among numbers, and number systems		Use precise mathematical language and notations to represent problem situations and mathematical ideas. Justify the steps in solving equations and inequalities.

Appendix B: Workshop Materials

This appendix contains sample materials used in the content comparison workshop. These include:

- Workshop protocol (for both Math and ELA workshops)
- Written instructions for participants in Math workshop
- Sample Math card
- Written instructions for participants in ELA workshop
- Sample ELA card
- Debriefing survey (for both Math and ELA workshops)

CAHSEE Content Comparison Study Workshop Protocol

Training Session

- Hand out instruction sheets and DOK levels.
- Review instruction sheet, and physically manipulate cards as example.
- Review DOK levels and key words/phrases.
- Hand out Sample DOK Objectives, and give 5 minutes to rate.
- Review sample objectives and discuss inconsistencies between raters and Webb.
- Review clarity rating scale.

- Hand out practice set to all panelists (small sample from 2 states).
- Give 20 minutes to do 1st sort and 2nd sort.
Panelists should:
 1. sort into piles
 2. label piles with letter
 3. provide title on description sheet.
- Discuss 1st and 2nd level separately.
- Discuss inconsistencies.

- Ask 1 or 2 panelists to review 2nd sort. Evaluate agreement with other panelists.
- Discuss example sorts to review points of inconsistency.

- Give 10-15 minutes to do DOK analysis and clarity rating on practice cards.
- Review at least 8 objectives – obtain show of hands per level.
- Discuss inconsistencies in ratings and try to come to agreement.

Rating Session

- Hand out card sets (1 per panelist).
- The same card set should be distributed to 2 reviewers.
- Raters should:
 1. quickly sort by standard and provide descriptive title on separate sheet.
 2. rate each objective on DOK and on clarity.
 3. conduct 2nd sort within categories. REMINDER: can move cards between categories if necessary, but must re-label sort 1.

- Allow reviewers to work until 11:30, then stop to ask for any questions or problems.
- Ask panelists to leave cards as they have them.
- After lunch, continue with sorts.
- Check on progress by 3pm.

Debriefing Session

- Once all panelists are done, ask to complete a brief survey on the task.
- Discuss survey and open to other comments.

Written Instructions for Participants in Math Workshop

Alignment Tasks for Mathematics

We ask you to review the high school content standards of several states, including the standards for the California High School Exit Exam (CAHSEE). You will receive a set of cards that includes content standards for several states. However, you will not know the identity of the state associated with each card. Individual cards represent a specific content objective associated with a standard for a given state. You will be working independently on this task. Please ask questions of the HumRRO staff if you have a question.

Step 1: Sort standards into general categories.

In this sort, you should focus on the standard titles. The titles vary some across states, so you should group together standards that cover similar content. For example, you could group together cards focusing on ‘number sense’ or ‘geometry’.

For each group, label all of the cards in that pile with the same letter (pile ‘A’, pile ‘B’, etc). On the separate sheet provided, write a brief descriptive title for the cards in each group.

Step 2: Determine depth-of-knowledge and the clarity of this objective.

Using the attached depth-of-knowledge (DOK) descriptions and examples, rate each objective (each card) on the degree of cognitive processing required of students to meet the objective. Write the number of the corresponding DOK level in the blank. Remember that *cognitive complexity* is related to *difficulty*, but these terms are not synonymous. If you find that a single objective really requires several different tasks of varying complexity (i.e., “Students should be able to identify, distinguish, and explain...”), indicate the *highest* DOK level required by this content objective.

Next, rate the clarity of this objective by evaluating how well the statement conveys the tasks that students are expected to perform to demonstrate mastery of the objective. Is the statement clear and precise, or did you have difficulty determining what is expected of students? Check the box that applies to your evaluation. If you check ‘Other’, please provide a brief explanation.

Step 3: Match objectives within each general category.

For each of the standards groups, sort the cards in the group into subgroups of similar objectives. For example, you may have a group of objectives labeled ‘number sense’, but some objectives focus on ‘rational numbers’ and other objectives focus more on ‘exponents’. Divide these cards into subgroups, and label the cards in each subgroup with a number (i.e., subgroup 1, subgroup 2). The subgroups may contain as few as two different objectives. If some objectives do not match the other objectives, check the box labeled ‘Unique’ and keep this objective separate.

In examining the objectives more closely, you may decide to move the objective into a different standards group than the one in which you placed it originally in Step 1. Cross out the original standard category letter on the card and write the new group letter beside the original.

Depth-of-Knowledge Levels for Mathematics

- **Level 1 (recall)** Item requires recall of information such as fact, definition, term or simple procedure, as well as performing a simple algorithm or applying a formula.

Key words: use, identify, recall, recognize, measure.

- **Level 2 (skill/concept)** Item calls for engagement of some mental processing beyond a habitual response, with students required to make some decisions as to how to approach a problem or activity, such as interpreting information from a simple graph, or visualization skills and probability skills.

Key words: classify, organize, estimate, make observations, collect and display data, and compare data, solve multiple parts, verify.

- **Level 3 (strategic thinking)** Item requires students to use reasoning and evidence, plan, and make conjectures. Students should be able to explain phenomena in terms of mathematical concepts and decide which concepts to apply in order to solve a problem.

Keywords: Combine multiple parts or solutions, make conclusions, explain (based on concepts or principals), interpret, apply.

- **Level 4 (extended thinking)** Items require students to use complex and abstract reasoning and thinking, often over an extended period of time. Students must relate ideas within the content area or among content areas, or they should select one method among many alternatives for how the problem should be solved.

Keywords: Design, plan, and develop procedures; make inferences from results; critique; prove.

Sample Math Card

Each Math card contained a single objective within a standard. They were printed on 5x7 inch cardstock in order to make the card sorting process easy. Each card included a randomly-assigned identification number (75, in this case) and a pre-printed Rater ID so that ratings across and within raters could be linked during the analysis phase. Cards did not identify the state from which the standard came.

No. 75**Rater B****Mathematics**

STANDARD: *Number Sense and Algebraic Operations*

The student will use expressions and equations to model number relationships.

OBJECTIVE: Simplify polynomials by adding, subtracting or multiplying.

Please refer to your '**Instructions Sheet**'. Check the appropriate box ☒ for Steps 2 and 3 below.

Step 1:	Sort standards into general categories.	Category Label (A,B,C...) _____
Step 2:	Determine depth-of-knowledge and the clarity of this objective.	DOK Level (1 to 4) _____ Mark one: <input type="checkbox"/> Clear in purpose and specific. <input type="checkbox"/> Not clear in purpose. <input type="checkbox"/> Too general. <input type="checkbox"/> Other (please explain).
Step 3:	Match objectives within each general category.	<input type="checkbox"/> Unique objective <input type="checkbox"/> Subgroup # _____

Written Instructions for Participants in ELA Workshop

Alignment Tasks for English-Language Arts

We ask you to review the high school content standards of several states, including the standards for the California High School Exit Exam (CAHSEE). You will receive a set of cards that includes content standards for several states. However, you will not know the identity of the state associated with each card. Individual cards represent a specific content objective associated with a standard for a given state. You will be working independently on this task. Please ask questions of the HumRRO staff if you have a question.

Step 1: Sort standards into general categories.

In this sort, you should focus on the standard titles. The titles vary some across states, so you should group together standards that cover similar content. For example, you could group together cards focusing on ‘reading comprehension’ or ‘writing strategies’.

For each group, label all of the cards in that pile with the same letter (pile ‘A’, pile ‘B’, etc). On the separate sheet provided, write a brief descriptive title for the cards in each group.

Step 2: Determine depth-of-knowledge and the clarity of this objective.

Using the attached depth-of-knowledge (DOK) descriptions and examples, rate each objective (each card) on the degree of cognitive processing required of students to meet the objective. Write the number of the corresponding DOK level in the blank. Remember that *cognitive complexity* is related to *difficulty*, but these terms are not synonymous. If you find that a single objective really requires several different tasks of varying complexity (i.e., “Students should be able to identify, distinguish, and explain...”), indicate the *highest* DOK level required by this content objective.

Next, rate the clarity of this objective by evaluating how well the statement conveys the tasks that students are expected to perform to demonstrate mastery of the objective. Is the statement clear and precise, or did you have difficulty determining what is expected of students? Check the box that applies to your evaluation. If you check ‘Other’, please provide a brief explanation.

Step 3: Match objectives within each general category.

For each of the standards groups, sort the cards in the group into subgroups of similar objectives. For example, you may have a group of objectives labeled ‘reading comprehension’, but some objectives focus on ‘story elements’ and other objectives focus more on ‘literary devices’. Divide these cards into subgroups, and label the cards in each subgroup with a number (i.e., subgroup 1, subgroup 2). The subgroups may contain as few as two different objectives. If some objectives do not match the other objectives, check the box labeled ‘Unique’ and keep this objective separate.

In examining the objectives more closely, you may decide to move the objective into a different standards group than the one in which you placed it originally in Step 1. Cross out the original standard category letter on the card and write the new group letter beside the original.

Depth-of-Knowledge Levels for English-Language Arts

- **Reading Level 1 (recall)** item requires students to receive or recite facts or to use simple skills or abilities, such as word pronunciation, verbatim recitation of text, or definitions of recognition of figurative language.

Keywords: Identify, list, determine, define

- **Reading Level 2 (skills/concepts)** item calls for engagement of some mental processing beyond recalling or reproducing a response; it requires both comprehension and subsequent processing of text or portions of text. Examples include using context cues to identify the meaning of unfamiliar words or summarizing major events in a narrative.

Key words: summarize, interpret, classify, organize, collect, display, compare, and determine whether fact or opinion. Literal main ideas are stressed.

- **Reading Level 3 (strategic thinking)** Students must synthesize ideas from the text to show understanding of ideas. They also may need to go beyond the text. Students must explain, generalize, or connect ideas. Items require reasoning and planning, and may involve abstract theme identification, inference across an entire passage, or students' application of prior knowledge.

Keywords: Compare/contrast, analyze, explain, synthesize or connect ideas (single text), similarities and differences, apply, infer, support

- **Reading Level 4 (extended thinking)** Higher order thinking is central, such as complex, reasoning, planning, inference, and synthesis of ideas from multiple sources. Students may need to develop hypotheses, perform critical analysis, and make connections among texts. Items may require extended time and thinking.

Keywords: Predict, discuss, dispute, connect to self, critically analyze, synthesize or connect (multiple texts)

Sample ELA Card

Each ELA card contained a single objective within a standard. They were printed on 5x7 inch cardstock in order to make the card sorting process easy. Each card included a randomly-assigned identification number (108, in this case) and a pre-printed Rater ID so that ratings across and within raters could be linked during the analysis phase. Cards did not identify the state from which the standard came.

No. 108
ELA

Rater K

STANDARD: *Reading and Responding*

Students apply reasoning and problem solving skills to their reading, writing, speaking, listening, viewing, and visually representing.

OBJECTIVE: Evaluate the effects of an author's life in order to interpret universal themes and messages across different works by the same author.

Please refer to your '**Instructions Sheet**'. Check the appropriate box ☒ for Steps 2 and 3 below.

Step 1:	Sort standards into general categories.	Category Label (A,B,C...) _____
Step 2:	Determine depth-of-knowledge and the clarity of this objective.	DOK Level (1 to 4) _____ Mark one: <input type="checkbox"/> Clear in purpose and specific. <input type="checkbox"/> Not clear in purpose. <input type="checkbox"/> Too general. <input type="checkbox"/> Other (please explain).
Step 3:	Match objectives within each general category.	<input type="checkbox"/> Unique objective <input type="checkbox"/> Subgroup # _____

Debriefing Survey

CAHSEE Content Comparison Workshop 2005

Content Area _____

- A. As a whole, did the state standards cover the topics you expected for high school? If not, what topics were not included that should have been? And, what topics were included that should not have been for this level?
- B. Did the state standards cover the most important performance (DOK levels) you expected for high school? If not, please explain as best you can.
- C. Did you find many unique content expectations? Would you consider the unique content you found to be necessary in a high school curriculum? If not, which content topics could be omitted? If possible, please write down the code number in the upper left corner of the card for the important unique objectives.
- D. Other comments.